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COUNTY BOROUGH OF BLACKBURN
EDUCATION COMMITTEE

ANNUAL REPORT
ON THE
School Health Service
FOR THE YEAR
1965



J. ARDLEY
M.B., B.S., D.P.H.
Principal School Medical Officer



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1965 - 66

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	H.	GREEN, Esq.

OFFICERS EMPLOYED IN THE SCHOOL HEALTH SERVICE

Principal School Medical Officer :

J. ARDLEY, M.B., B.S., D.P.H.

Deputy Principal School Medical Officer :

J. Q. MOUNTAIN, B.Sc., M.D., D.P.H.

School Medical Officers :

BERYL SEPHTON, M.B., Ch.B., D.P.H.

L. P. GRIME, L.R.C.P.I. & L.M., L.R.C.S.I. & L.M., D.P.H., M.N.Y.A.S.

S. V. JOSHI, M.B., B.S., D.C.H., D.P.H.

SARAH N. JOSEPH, M.B., B.S., D.R.C.O.G., M.M.S.A., D.P.H.

Assistant Medical Officers (Part-time) :

E. CARTER, M.B., Ch.B., D.P.H.

C. Y. HOWARTH, M.B., Ch.B.

MARGARET S. GISBOURNE, M.B., Ch.B.

Part-time Consultant Medical Officers :

J. EVANS, M.D., F.R.C.S. (Oto-Rhinology).

R. WARD, M.D., M.R.C.P. (Chest Physician).

P. R. STEVENS, M.R.C.S., L.R.C.P., D.O. (Ophthalmology).

Part-time Consultant Orthodontist :

L. C. G. HODGKINS, L.D.S.

Dental Officers :

J. RIGBY, L.D.S., Principal School Dental Officer.

J. GREGSON, B.D.S.

Part-time Dental Officers :

Mrs. M. C. S. CODLING, B.D.S., L.D.S. (to May).

Mrs. L. G. BURKE, B.D.S., L.D.S. (from September).

Superintendent Nursing Officer :

Miss L. M. BROWN, S.R.N., S.C.M., H.V.Cert., Cert. R.S.H.

Medico-Social Work, Health Visiting and Clinic Nursing :

Medico-Social Workers	22
Health Visitor/School Nurses	4
Clinic Nurses (including part-time)	7

Physiotherapy :

Senior Physiotherapist	Mrs. M. Kempton, C.S.P.
Physiotherapists	2 (one part-time)

Orthoptists :

Miss A. Greenwood, D.B.O.

Speech Therapist :

Mrs. K. S. Stourton, L.C.S.T.
(to Sept.)

Dental Attendants :

Senior Dental Attendant	Miss L. E. Walsh
Attendants	2 (one part-time)

Clinic Attendants :

2

Health and Welfare Department,
Victoria Street,
Blackburn.

June, 1966.

Mr. Chairman, Ladies and Gentlemen,

I have pleasure in presenting my seventh Annual Report and 60th of the series, on the work of the School Health Service during 1965.

The Poliomyelitis outbreak and the illness at St. Hilda's School meant that much routine work had to be curtailed. Nevertheless, this should not cause undue concern provided the department can recover the ground lost during the next 12 to 18 months.

The Poliomyelitis outbreak took most of the unwanted limelight to which the Local Health Services were subjected during 1965. Even so, the illness which struck St. Hilda's School was, in itself, a problem of no small magnitude.

The account given in this Report will, it is hoped, give you, Mr. Chairman and members of the Committee, some idea of the scope of the investigations which took place. It is felt, too, that the data will provide a useful reference for other medical officers, now or in the future who may be faced with similar situations.

If the working year was so much dominated by the two outbreaks, then to a similar extent so must the respective Annual Reports.

However, I draw the Committee's attention to an article by Dr. L. P. Grime, one of your School Medical Officers, in "The Medical Officer," and which is reproduced as an Appendix to this Report. Editorial comment referred to the article as "a remarkably clear account of the theory and practice of programmed learning."

Much of the work of investigation into the St. Hilda's outbreak was also Dr. Grime's responsibility. The two accounts, therefore, throw some light on the wide variations of responsibility which can fall on the Junior Medical Staff ; in the one instance, having been "thrown in at the deep end" as it were at St. Hilda's, the other being a good example of the experimental fields open to keen members of a Preventive Health team which often go unnoticed under normal conditions.

Thank you, once again, Mr. Chairman and Members of the Committee, for your support and encouragement during a particularly difficult year.

Your obedient Servant,

J. ARDLEY,
Principal School Medical Officer.

SCHOOL CLINICS

<i>Designation</i>	<i>Purpose</i>	<i>Where held</i>	<i>Time</i>
Inspection ..	Special Examination of Cases referred by Teachers School Welfare Officers and School Nurses	Richmond Terrace	Wednesday 2.0 p.m. Friday 2.0 p.m.
Ophthalmic	Prescription of Spectacles	„	Monday 8.30 a.m. Tuesday, 2.30 p.m. Thursday, 2.30 p.m. (By appointment)
Dental Clinic	Dental Treatment	„	Every week-day (by appointment).
Minor Ailments	Treatment of Minor Diseases of Skin, etc. . . .	„	Every week-day at 8.45 a.m.
Cleansing ..	Treatment of Scabies and Cleansing of Verminous Cases.	Blakey Moor	By appointment
Physiotherapy	Treatment of Postural Defects, Sunlight	Richmond Terrace	Every week-day (by appointment).
Immunisation	Immunisation against Diphteria, Whooping Cough and Vaccination against Poliomyelitis	„	Monday, 3.45 p.m. or by appointment.
Vaccination	Vaccination against Small-pox, and Tuberculosis	„	By appointment
Ear, Nose and Throat	Treatment of Deafness, etc.	„	As required (by appointment)
Audiology ..	Diagnosis of Hearing Defects	„	By appointment
Orthoptic ..	Correction of Strabismus	Victoria Street	Every week-day (By appointment)
Speech	Correction of Speech Defects	St. Peter Street	Every week-day (By appointment)
Chiropody ..	Treatment of Foot Defects	King Street and Bridge Street	By appointment

COST OF SCHOOL HEALTH SERVICE

I am indebted to the Borough Treasurer, Mr. L. Wolstenholme, for the following particulars relating to the cost of the School Health Service during 1964-1965.

EXPENDITURE

		£ s. d.	£ s. d.
Salaries .. .. .. ..	..	30,652	5 2
Fees .. .. .. ..	..	2,344	9 0
Local Government Superannuation—			
Employer's Contribution .. .. ..	..	1,641	9 7
Equal Annual Charge .. .. ..	..	633	1 4
National Insurances—			
Employer's Contributions .. .. ..	..	760	9 8
Staff Training .. .. .. ..	..	211	14 0
Travelling Expenses and Subsistence			
Allowances .. .. .. ..	..	392	6 8
Printing, Stationery, Postages and			
Telephones, etc. .. .. .. ..	..	286	16 7
Drugs, Medical Requisites and Apparatus ..	..	1,973	11 7
Uniforms .. .. .. ..	..	275	10 8
Rents and Insurances .. .. .. ..	..	37	16 3
Upkeep of Buildings .. .. .. ..	..	2,187	16 9
Medical Inspections—Intending Teachers			
.. .. .. ..	..	309	15 0
Sundries .. .. .. ..	..	3	9 6
		<hr/>	<hr/>
		41,710	11 9

INCOME

Recovered from—

Blackburn Executive Council,			
N.H.S. (Sight testing) .. ..	..	676	17 6
Regional Hospital Board—			
Orthoptic Clinics .. .. ..	..	405	19 4
Lancashire County Council—			
Orthoptic Clinics .. .. ..	..	561	2 6
Services to Health Department—			
Dental Sessions .. .. ..	..	151	4 0
Services to Welfare Department—			
Physiotherapy Sessions	458	15 5
Sundries	33	12 8
		<hr/>	<hr/>
		2,287	11 5

EXPENDITURE LESS INCOME	£39,423	0 4
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The rateable value of the Borough on 31st March, 1965, was £3,215,809. The cost of medical inspection and treatment in schools for the twelve months ended 31st March, 1965, was £39,423, compared with £34,755 in the previous year.

This was equivalent to £2. 9s. 2d. per child on the school rolls, and expressed as a penny rate was 3.18d.

SCHOOL POPULATION

Particulars of children on the rolls at maintained schools are as follows :

3	Nursery Schools	..	..	120
54	Primary School Departments	..	..	9,889
14	Secondary Schools	..	..	5,482
3	Special Schools	..	..	282
	Total	..	..	<u>15,773</u>

SECTION ONE

MEDICAL INSPECTION

The programme of Routine Medical Inspection, adopted in 1955, has been continued.

The year's findings are set out on pages 11 to 13 whilst Table 1 below shows the numbers of children examined in years of birth of Groups examined

Table 1.

Year of Birth of Groups Examined	WEST DIVISION	EAST DIVISION	TOTAL
1950 and earlier	167	271	438
1951.....	113	223	336
1952.....	..	..	..
1953.....	155	174	329
1954.....	366	355	721
1955.....	..	..	..
1956.....	..	4	4
1957.....	21	10	31
1958.....	38	16	54
1959.....	105	42	147
1960.....	265	146	411
1961 and later	18	57	75
TOTALS	1248	1298	2546

ROUTINE MEDICAL INSPECTIONS DURING 1965.

(a) Attendance of Parents at Inspection

Table 2

Year of Birth of Groups examined	WEST			EAST			COMBINED		
	No. Exam.	Par'nts Pres'nt	%	No. Exam.	Par'nts Pres'nt	%	No. Exam.	Par'nts Pres'nt	%
1950 and earlier	167	15	9	271	16	6	438	31	7
1951 ..	113	11	10	223	8	3	336	19	6
1952 ..	..	..	..	..	..	..	..	..	..
1953 ..	155	102	65	174	92	52	329	194	59
1954 ..	366	250	68	355	179	50	721	429	59
1955 ..	..	..	..	..	..	..	..	..	..
1956 ..	..	..	..	4	..	..	4	..	..
1957 ..	21	19	90	10	8	80	31	27	87
1958 ..	38	32	84	16	10	62	54	42	78
1959 ..	105	89	84	42	34	81	147	123	84
1960 ..	265	235	88	146	137	94	411	372	90
1961 and later	18	15	83	57	41	72	75	56	74
TOTALS ..	1248	768	61	1298	525	40	2546	1293	50

(b) General Condition

The general condition of children examined at Routine Medical Inspection during 1965 was again satisfactory.

(c) Visual Defects and External Diseases of the Eye

Of two hundred and twenty-nine children found to have defective vision, two hundred and fourteen were referred for treatment.

In addition to those children with defective vision, thirteen were found with squint, and three with "Other forms of external eye disease." All but one were referred for treatment.

(d) Ear Disease and Hearing Defects

At Routine Medical Inspection, fifty children found to have ear trouble were dealt with as follows :

			Referred for treatment		Referred for observation		Total
Hearing	..	..	41	..	1	..	42
Otitis media	..	..	4	..	3	..	7
Other	..	..	1	..	—	..	1

(e) Nose and Throat

Twenty-four children were referred for treatment and twelve were placed under observation.

(f) Defective Speech

At routine inspection, eleven children were found to be suffering from speech defects, six of whom were referred for treatment.

(g) Orthopaedic Defects

Fifty-three children were discovered at routine medical inspection as follows :

			Requiring Treatment		For Observation		Total
Posture	..	..	6	..	1	..	7
Feet	..	..	27	..	4	..	31
Other	..	..	11	..	4	..	15

(h) Heart and Circulation

Three children were referred for treatment and five for observation as a result of defects found at Routine Medical Inspections.

(i) Lungs

Thirteen children were found to have respiratory defects of varying degree, seven of which required treatment.

(j) Miscellaneous Defects

The following table sets out details of other defects found at Routine Medical Inspection :

Table 3.

DEFECT	Requiring Treatment	For Observation	TOTAL
Skin	30	1	31
Lymphatic Glands	1	4	5
Development			
(a) Hernia	2	6	8
(b) Other	4	3	7
Nervous System			
(a) Epilepsy	1	—	1
(b) Other	—	—	—
Psychological			
(a) Developmental	8	14	22
(b) Stability	—	3	3
Abdomen	1	2	3
Other	23	11	34

Table 4.

(k) Comparative Table of Referrals by Division

DEFECT	Requiring Treatment			For Observation		
	WEST	EAST	TOTAL	WEST	EAST	TOTAL
Skin	38	2	40	1	..	1
Eyes : Vision	102	112	214	8	7	15
Squint	11	1	12	1	..	1
Other	1	2	3	..	..	..
Ears	44	2	46	4	..	4
Nose and Throat	21	3	24	11	1	12
Speech	4	2	6	2	3	5
Lymphatic Glands .. ..	..	1	1	4	..	4
Heart	3	..	3	3	2	5
Lungs	4	3	7	3	3	6
Developmental	6	..	6	9	..	9
Orthopaedic	33	11	44	6	3	9
Nervous System	1	..	1	..	..	..
Psychological	7	1	8	7	10	17
Abdomen	1	..	1	1	1	2
Other	2	21	23	3	8	11
TOTALS	278	161	439	63	38	101

Heights and Weights.**Table 5.****WEST DIVISION.**

Group	BOYS			GIRLS		
	No. Examined	Average Height in Inches	Average Weight in Pounds	No. Examined	Average Height in Inches	Average Weight in Pounds
1950 & earlier	87	64	103½	78	62	112
1951	80	63	101	33	60	95½
1952	—	—	—	—	—	—
1953	72	57½	80¾	83	57	82½
1954	183	55½	74	183	55½	73¾
1955	—	—	—	—	—	—
1956	—	—	—	—	—	—
1957	12	49	60½	9	52	60½
1958	22	44¾	46¾	16	45	45¾
1959	41	42½	46½	64	41½	42½
1960	134	40½	40½	131	41¼	43¾
1961 and later	9	37	44¾	9	38	42½

Table 6.
EAST DIVISION.

Group	BOYS			GIRLS		
	No. Examined	Average Height in Inches	Average Weight in Pounds	No. Examined	Average Height in Inches	Average Weight in Pounds
1950 and earlier	52	63	104	33	63	110
1951	127	61	101½	98	63	97
1952	—	—	—	—	—	—
1953	—	—	—	—	—	—
1954	76	57	74	89	57	83
1955	201	54	76	162	56	75
1956	—	—	—	—	—	—
1957	—	—	—	—	—	—
1958	—	—	—	—	—	—
1959	29	45	45	31	45	44
1960	94	42	46	97	43	45
1961 and later	109	41	42	115	41	39

Following-up (WEST and EAST Divisions combined) :*Home Visits*

Follow up ..	..	..	..	2,495
Infectious Diseases ..	..	..	..	420
Ineffective visits ..	..	..	..	177

Special Visits

Special Education Examinations ..	..	175
Physically Handicapped ..	..	115
Maladjusted ..	..	96
		<u>3,478</u>

Table 7.
Visits to Schools

Cleanliness ..	..	..	..	27,168
Infectious Diseases ..	..	..	..	160
Other reasons ..	..	..	..	5,186
				<u>32,514</u>

School Hygiene Inspections

Children free from infection ..	..	..	24,602
Children requiring treatment ..	..	..	2,566
			<u>27,168</u>
TOTAL CLINIC SESSIONS ATTENDED	..	1,256	

SECTION TWO

TREATMENT

Clinics.

Location of the various Clinics is shown on Page 7 of the Report.

Inspection Clinic.

Inspection Clinics at which the School Medical Officers examine children referred for special examination, are held on Wednesday and Friday afternoons. During the year, 1,064 children paid 1,166 visits to the 83 Clinics which were held.

Minor Ailments.

Treatments are given every morning at the School Clinic, by a School Medical Officer assisted by two school nurses.

Table 8.

Complaint	Cases	Attendances
Ringworm—Scalp	—	—
Body	3	3
Scabies	38	107
Impetigo	36	255
Other Skin Diseases	157	471
Minor Injuries	162	434
Verminous Head	91	167
Otorrhoea	—	—
Other Ear Defect or Disease ..	30	52
Blepharitis	1	3
Conjunctivitis	—	—
Other External Eye Disease ..	5	12
Miscellaneous	14	24
TOTALS	537	1528

Tonsils and Adenoids.

In all, three hundred and sixty-nine children were operated upon during the year, two hundred and seventy-three at Queen's Park Hospital, fifty-three at the Royal Infirmary and forty-three at Accrington Victoria Hospital. At the end of the year, there were one hundred and sixty-four children on the operation waiting list compiled by the School Health Service.

The department is notified of all children operated upon, to ensure follow-up on discharge.

Visual Defects.

The Authority has continued to use the Supplementary Ophthalmic Services for the supply of spectacles to school children. Three clinics are held each week, attended by the Consultant Ophthalmologist, Mr. P. R. Stevens.

During 1965, one thousand eight hundred and seventy-six attendances were made at one hundred and nineteen ophthalmic sessions. Of these attenders, five hundred and nineteen were new cases : spectacles were prescribed for nine hundred and fourteen children.

Physiotherapy and Remedial Exercises Clinic

PATIENTS TREATED AT THE PHYSIOTHERAPY CLINIC AND
AT THE OPEN AIR SCHOOL

Table 9.

	PHYSIOTHERAPY CLINIC								OPEN AIR SCHOOL	
	REMEDIAL EXERCISES				ELECTRICAL TREATMENT					
	School		Pre-School		School		Pre-School		Cases	Attendances
	Cases	Attendances	Cases	Attendances	Cases	Attendances	Cases	Attendances		
Breathing Exercises	40	277	2	24	..	..	..	..	49	901
Postural Defects ..	14	128	..	..	..	..	..	..	13	199
Spinal Curvature ..	2	59	..	..	..	..	..	..	..	..
Poliomyelitis	2	19	..	..	2	19	..	..	1	28
Congenital Defects	13	155	13	179	6	91	..	..	7	197
Defects of the Feet	130	1465	50	538	3	46	..	..	4	47
Genu Valgum	36	358	41	458	1	13	..	..	..	..
Result of Accident	12	91	1	1	9	76	..	..	3	5
Other	1	2	..	..	1	2	..	..	..	..
TOTALS	250	2554	117	1200	22	247	..	..	77	1377

Ultra Violet Light Treatment

One hundred and forty-two children underwent ultra violet light treatment and received a total of 2,289 exposures, as follows :

	Cases	Exposures
Physiotherapy Clinic	..	115 .. 1732
Open Air School	..	27 .. 557

Orthoptic Clinic.

The staffing situation at the end of 1964 (one full-time and one part-time Orthoptist) continued until the end of October, when the latter (Mrs. Ainsworth), left.

It is anticipated that Miss M. Watt, Bursary Student, will return on qualification in January, 1966.

Until November, full sessions were carried out at the Victoria Street Clinic, with five sessions per week at Blackburn Royal Infirmary. During the last two months of the year, the number of sessions at each department were reduced accordingly.

Fortnightly sessions with the consultant Ophthalmologist were held at the Victoria Street Clinic, and a total number of 138 operations were carried out for squint correction.

This now brings the average waiting time for admission down to three months.

The statistics for the year are as follows :—

SCHOOL CLINIC (VICTORIA STREET)—

	Borough	County
New Cases	84	109
Number Cured	71	74
Number discharged		
cosmetically straight	27	28
Number as left District or		
failure to attend	50	
Number of Children attended ..	437	441
Number of attendances	3,177	

BLACKBURN ROYAL INFIRMIARY

Number of New Cases	267	
Number of County Visits	840	{ 1,387
Number of Borough Visits	547	
Number of Operations	138	

Speech Clinic.

The Speech Clinic, re-opened in September, 1964 on the appointment of Mrs. K. Stourton, closed again in August, 1965.

At that time, 61 children were undergoing treatment ; attendances during the year totalled 1,018.

Child Guidance Clinic.

During the year fifty-five children were seen by the Psychiatrist and Educational Psychologist. Two were awaiting examination at 31st December, 1965.

The results of the cases referred were :

	Total
Children for Day E.S.N. School	3
No further action	17
Recommended for Residential School	5
Deferred action	30

Cleansing of Children.

The School Nurses continue to pay regular visits to Schools to examine children for the presence of infestation. During 1965, 27,168 such examinations were made and 2,566 incidents of infestation recorded.

The Clinic Attendant continued to carry out systematic cleansing, and in all, seven thousand nine hundred and thirty five treatments were given to four hundred and ninety two children. All treatments were carried out in school.

Audiometry.

During 1965, the part-time audiometrist tested 2,709 children : 1,919 passing the test covering six different frequencies, at not more than 20-db. loss. 242 were referred to the special clinic for further investigation and 548 who failed by narrow margins were listed for re-testing at the next visit to their school.

A special audio clinic is held once per week which includes full histories, a general examination of the child's nose and throat, as well as auroscopic examination of the ears and a full audiogram. The recommendations after examining 62 cases were as follows :

	West	East
Referred to own doctor	—	—
Referred to E.N.T. Consultant	25	18
For observation and retest after a period	5	1
* For forward placing in class	5	—
For Minor Ailment Clinic	2	—
Referred to other Consultants	1	—
No further action required	8	—
Speech Therapy	—	—
Ultra Violet Light	—	—
Open Air School	—	—
For Breathing Exercises	2	—

* All of these appear in other referrals

It must not be thought that the eight cases requiring no action and the six for observation indicated wasted effort as many were due to simple disorders such as wax, catarrhal otitis media, etc., which were dealt with at the time. Also a number of the no action cases resulted from the noisy conditions under which testing has to be done in some schools.

SECTION THREE

DENTAL INSPECTION AND TREATMENT

I am indebted to Mr. J. Rigby, L.D.S., Principal Dental Officer, for the following report on the work of the School Dental Service during 1965 :

In May, Mrs. M. Codling resigned her part-time appointment and was replaced by Mrs. Burke in September.

The staffing position, therefore, remains as last year, namely, two full-time officers and one part-time officer working three sessions per week.

A study of the Report shows that the numbers of extractions and conservations increased in 1965, average attendances per child (Orthodontic patients excluded) being 2+ whilst the cases completed were approximately 2,150. Children who reported to the Clinic without appointments numbered about 1,000 ; of these, 80% were in need of emergency treatment. In fact, one child in five attends as a 'casual' patient and one period of 45 minutes is set aside daily from Monday to Thursday for these children to avoid interference with routine cases.

Orthodontic patients average ten visits per child. Due to this and the restricted availability of the Orthodontist (Mr. Hodgkins) who can only attend on two sessions per week, a waiting list is unavoidable and at the end of 1965, 50 patients were awaiting first appointments.

It follows, therefore, that treatment should only be commenced where the fullest co-operation and interest of both child and parent can be obtained. This is particularly important in maintaining oral hygiene, as the wearing of appliances encourages the lodgment of food debris between the plate and the teeth. Even with the most diligent child, cavities are apt to be created, and Orthodontic cases are normally referred back to the dental officers for routine checks every six months.

There has been an increase of one third in the number of local injections carried out, accounted for by the use of a 'local' for conservation work, now often requested by the patient. General anaesthetics are normally given once weekly, although in an emergency treatment can be carried out in 24 hours.

At school dental inspections an increasing awareness of the importance of oral hygiene is apparent, whilst far more conservation work is being carried out each succeeding twelve months.

One concluding note of a pleasing character is that more appointments have been kept in 1965 than the preceding year.

In closing, might I thank the dental staff for their loyalty ; the Anaesthetist and members of the School Medical Staff for their help. Teaching staff have, as usual, given their full co-operation during routine inspections and the ensuing arrangement of appointments. To them, also, my sincere thanks.

J. RIGBY,

Principal Dental Officer.

ROUTINE DENTAL TREATMENT

Permanent Teeth Fillings	2522
Temporary Teeth Fillings	581
Extractions	3609
Other Operations (including Orthodontic treatment) ..	1730
General Anaesthetics	620
Percentage with dental caries	63%
Percentage of appointments kept	87%

ORTHODONTIC TREATMENT

(By the Consultant Orthodontist, Mr. L. C. G. HODGKINS, L.D.S.)

Cases carried over from previous year	59
Cases commenced during the year	42
Cases completed during the year	30
Cases discontinued during the year	7
Pupils treated with appliances	51
Removable appliances fitted	55
Fixed appliances fitted	2
Total Attendances	713

DENTAL TREATMENT

Table 10

SECTION FOUR

INFECTIOUS DISEASES

Information as to the incidence of non-notifiable infectious disease is obtained from teachers, welfare officers, public health inspectors, health visitors and parents.

The following table gives particulars of cases of infectious diseases occurring in school children during 1965.

Table 11.

		Scarlet Fever	Diphtheria	Measles	Whooping Cough	Chicken Pox	Mumps	Dysentery	Primary Pneumonia	Acute Poliomyelitis	Cerebro-Spinal Fever
January .. .		1	-	130	-	5	1	1	-	-	-
February .. .		8	-	82	1	28	-	4	-	-	-
March .. .		2	-	78	1	2	6	1	-	-	-
April .. .		5	-	59	-	2	2	1	-	-	-
May .. .		2	-	39	-	9	-	3	-	-	-
June .. .		2	-	39	-	33	1	1	-	-	-
July .. .	}	9	-	24	-	23	2	-	1	9	-
August .. .		10	-	1	1	4	3	3	-	5	-
September .. .		5	-	1	-	2	5	-	-	-	-
October .. .		8	-	-	-	1	3	-	-	-	-
November .. .				453	3	109	23	14	1	14	-
December .. .				TOTALS ..	50	-					

SECTION FIVE

HANDICAPPED PUPILS

Ascertainment

The arrangements for the ascertainment of pupils requiring special educational treatment are covered by regulation of the Minister of Education, and have been detailed in previous reports.

Special School Provision

There are three special schools provided by the Authority, an Open Air School for Delicate children, a school for Partially Sighted Pupils in Corporation Park and Crosshill School for Educationally Subnormal Pupils.

Partially Sighted Pupils are admitted to the Special School in Corporation Park. At the end of the year, seventeen children (nine boys and eight girls) were in attendance.

I append a report of the School's activities by the Headmaster, Mr. H. H. Evans :

The year began with 16 children on roll (nine boys and seven girls). No children have left the school and one boy from Bolton was admitted in February, so that at the end of the year the number on roll is 17 (ten boys and seven girls) with an age range of 8+ to 16+ years.

Requests for the placing of children in the school by another Education Authority could not be accepted because the number on roll has, for some time, been slightly in excess of that recommended. A further point also to be considered is that the very wide I.Q. range, coupled with other secondary disabilities from which some children suffer presents a sufficiently large challenge to the teaching staff available.

During the last year we have received a number of requests for advice and assistance from schools in Wales and Scotland and the Ophthalmic Department of a Scottish Teaching Hospital on such subjects as teaching methods, apparatus and furniture used in the education of partially-sighted children.

The school entertained a considerable number of visitors during the year, including students and also qualified teachers of long standing seeking advice and information on all aspects of the education of children with defective vision. In addition a mother of a young boy from Bolton came for half a day to "sit in" with her son during his academic work and to see just what he was capable of achieving and also to learn how best she could help at home in furthering the boy's education in the widest sense. Again the small unit shows up to advantage in cases like this since the teaching is very largely individual and no undue disruption is caused.

Twelve prize cards and money prizes were gained by the children at this year's Agricultural Show and a fair cross section of art, crafts and needlework was entered.

With the closing down of Regent Street Domestic Science Institute we were without a centre for the senior children to attend and our thanks are due to Mr. A. Pomfret, the Headmaster of Bangor Street Secondary Modern School, for providing us with a full half day session at his school until July of this year. After the summer holidays we were able to establish ourselves in Four Lanes End Domestic Science Institute, the successor to Regent Street, and so there was no break in the children's Domestic Science training.

In November, the lady doing duty as caretaker, meals server and afternoon welfare assistant retired and again we have been fortunate in securing an excellent replacement for her. The lady newly appointed has a high degree of skill in several forms of craftwork which is of tremendous help in a school such as this.

Attendances this year have been lower than usual, but this is understandable when one considers that hospitalisation to improve some of the secondary disabilities already referred to accounts for the majority of the absences.

For this and one or two other reasons no Nativity Play was presented this year—with such a small number on roll there is no opportunity to train understudies. However, the children enjoyed a varied film show and also had a successful Christmas party.

In closing this report, I must again express my sincere thanks to all part-time members of the staff, both teaching and welfare, for their continued enthusiasm and dedication.

H. H. EVANS, *Headmaster.*

Open Air School

I append a report of the Headmaster, Mr. H. Harling, on the School :—

Twenty-three children were admitted and thirty-one discharged during 1965, one hundred and thirty-three being in attendance at the end of the year. A comparison of these figures with those for 1964 show that there has been a drop of 24 in the number of children admitted.

The reasons for the admission of the twenty-three new cases were as follows :

General Debility .. .	5	Nasal Catarrh.. ..	2
Delicate	3	Catarrhal Conductive	
Asthma	5	Deafness .. .	1
Sinusitis	1	Nervous Debility ..	2
Bronchitis	2	Re-admitted .. .	2

The children on roll in December, 1965, fall into the following categories :

Delicate	107	Epileptic	2
Physically handicapped ..	19	Speech Defect	4
Partially sighted ..	1		

The physically handicapped represent 14% of the number on roll and they seem to find little difficulty in adapting themselves to life in a school of this type providing their handicap is not too severe. Where the complaint imposes undue limitations on activity the child can become so frustrated as to present a behaviour problem. One such child has been recommended for placing in a residential school for the physically handicapped where a readiness to come to terms with the handicap will not be affected by constant comparisons with more active children.

There were four thousand and sixty-one visits by children to the medical room during the year. Children having fits were attended on forty-one occasions by the school nurse ; seven children were sent from school to the Blackburn Royal Infirmary. As usual many children having fits and minor complaints were attended by teachers and a number of sick children were taken home by car.

We now have two part-time Physiotherapists who between them are able to attend two and a half days each week. This arrangement seems quite satisfactory as one physiotherapist is able to deal with individuals requiring special treatment whilst the other is able to concentrate on group work ; breathing exercises, posture exercises and sunlight.

Average attendances were : Easter Term, 79.5% ; Summer Term 81.2% ; Autumn Term 78.9%. The highest weekly percentage of average attendance was 86.1%.

Our grateful thanks are due for the constant help rendered by the School Medical Service and by all departments of the Education Office. I offer also my sincere thanks to all school staffs both permanent and part time.

T. HARLING, *Headmaster.*

Educationally Subnormal Pupils.

During the year, eighty-four children have been examined regarding their mental condition, with results as follows:

		West		East
Recommended for Special Day Schools	..	14	..	22
Recommended for Special Residential Schools		—	..	—
Required no action	..	..	..	11
Decision deferred	..	..	..	—
Unsuitable for education at school	..	..	..	—
Referred to Child Guidance Clinic	..	..	..	6
Discharged from Special School	..	..	2	—

At the end of 1965, one hundred and thirty-two children (78 boys and 54 girls) were in attendance at Crosshill Special School.

I append the report of the Headmaster, Mr. F. Duerden, on the School's activities during the year.

During the year 50 children were admitted (48 new entrants and two re-admissions) and 28 left : two entered employment, seven left town, eight were committed to Residential and Approved Schools, three were

ascertained to be ineducable, one was under medical observation, and two were deascertained and returned to Secondary Schools. By the end of the year there were 132 children on roll.

During the ten years at Four Lanes' End the organisation and smooth progression of the remedial work was much impeded by the accommodation being limited to 100 and by the absence of any regularised system of reporting suspected E.S.N. children to the L.E.A. for investigation. This resulted in (a) a permanent waiting list for entry—many children, after being on the list for years, never being able to enter the school ; and (b) a disbalance of ages within the school, compelling some children to remain for undue periods in the same class because others were being admitted late in their school life. The difficulties arising from limited accommodation had to be accepted, but in my annual reports over many years I consistently called attention to the lack of system in reporting children—unfortunately with no result. I quote from my report for 1961—

“ The casual system of reporting suspected E.S.N. children to the Authority.

In common with many other Local Authorities, Blackburn has no regularised system of reporting suspected E.S.N. children for medical ascertainment. Broadly, anyone who comes in official contact with children can suggest that an examination would be advisable, but whether or not this reporting is done appears to be entirely discretionary. This is not so in the progressive larger Authorities where procedure is laid down resulting, by and large, in the ascertainment of these children at an appropriate age (usually round about 7). If such a system were in operation in Blackburn, and I would stress that there are no inherent difficulties in instituting this, the vast majority of organisational problems within this school would be eliminated. Further, the smooth progression to an extension of E.S.N. provision in the future, and an extension to the educational remedial work in “ordinary” schools, would be facilitated.

The competing claims of various priority classes.

Many priority cases are children who have developed behaviour problems or drifted into delinquency over a long period and their educational sub-normality has only been officially established during their later school life. An E.S.N. child does not suddenly become E.S.N.—limited ability, not attainment, is the operative factor and this is equally evident at 7 years as 13 years old. My mental reaction on receipt of such cases is always ‘ If this child had been ascertained at 7 years of age and he could have received appropriate treatment he might not have developed the anti-social tendencies he is now showing.’ Systematized ascertainment would have discovered his needs years before. These cases are increasing.”

Crosshill was adapted to accommodate 180 children and prior to the transfer in August, 1964, the Staff and myself had high hopes that the building-up period, as far as the number on roll was concerned, would not be unduly protracted, and that a definite effort would be made by the Authority to implement that section of the 1944 Education Act which requires each L.E.A. at least to ascertain the number of E.S.N. children in their area.

Neither of these hopes has been realised. By the end of 1965 out of 80 extra places only 32 have been filled. It is true that at the beginning of each term the waiting list which has developed during the previous term is eliminated but there is every indication that a considerable period will elapse before all available places are filled. Quite apart from the difficulties

of organisation and future planning engendered by such a slow build up, a much more serious consideration is that there must be many E.S.N. children who are still in schools for which they are unfitted. Statistical records, kept over many years, appear to suggest that the disbalance of ages within the school is being perpetuated rather than eliminated, and that the late entry of children appears to be increasing—

Ages at end of year (Percentages) :

	16+	15+	14+	13+	12+	11+	10+	9+	8+	7+	6+
1961	—	1	16	16	16	16	14	11	5	3	1
1965	3	7	14	11	11	17	14	10	7	5	1

Ages between 11 and 15 on admission :

1957 — 61 24.5 of all new entrants

1962 — 65 26.9 „ „ „ „

Since Crosshill opened — 29%

Each year I personally test each child in the Basic Subjects (Number and English) using Schonell's standardised tests. As the English results can be more easily expressed in a form understandable to the layman, from time to time I give an analysis in my annual report together with those of previous years. Direct comparison is impossible since the children concerned are not the same children over the whole period and their social competence or emotional stability is not indicated. "Non-starter" is my own term for a child who fails to score on the test the lower limit of which is a reading age of 5 years. I have chosen the years quoted because absences at the time of, and entries subsequent to, testing resulted in the same number of children—

Reading Ages in Years

	14+	13+	12+	11+	10+	9+	8+	7+	6+	5+	Was N.S.	N.S.
1955 (99 Tested)	—	—	1	1	2	7	19	24	11	21	13	42
1960 („ „)	4	3	2	6	4	6	17	25	11	12	9	43
1965 („ „)	1	2	1	1	4	2	13	23	17	27	8	35

Much thought was given during the year to the advisability or otherwise of introducing the i.t.a. system of reading but although there was a great deal of information published regarding results with normal children there was little in regard to E.S.N. children. Owing to the nature of the organisation and teaching in the school it was not possible to do much experimental work in this direction. Towards the end of the year, however, it became apparent that there would be an increasing number of new entrants who had been working with this method, and it was decided to run the two methods side by side. If this proves successful it will be extended in 1966. It is too early to estimate the relative value of the two methods, as is the case with another radical change made on transfer to Crosshill. This concerns the teaching of the basic subjects. At Four Lanes' End the groups for these subjects (as distinct from classes for other subjects) were composed of children of the same ability with no reference to their chronological age. This meant a great deal of physical movement each day and an inordinate number of changes within each class and group each term. This worked admirably in a small compact building but realising that there would be time-wasting and confusion in larger premises it was decided that each

child should be taught the basic subjects in his own class whatever his ability. At the moment there is every indication that the progress of each child will not be retarded and at the same time there will be an undoubted gain on the emotional side in strengthening the feeling in the child that he is a member of a school family and that his teacher is his personal friend. He still comes in contact with other Staff members as teachers who are specially qualified, or interested in, particular subjects take them with other classes besides their own.

A great part of our work has always been concerned with the emotional difficulties of individual children and on the whole they are willing voluntarily to talk about them, appreciating that we are prepared to help them. Unfortunately the year was marked by an inordinate increase in truancy and persistent delinquency, in common with most schools. This presumably reflected the deterioration in standards of good behaviour and the increase in reprehensible conduct so noticeable in the outside world. The E.S.N. child is more easily influenced than the ordinary child and we were compelled to spend a vast amount of time, which should have been spent on teaching, in trying to protect them from these pernicious influences inside school. During the year a total of 12 boys spent periods in Remand Homes, seven of them being eventually committed to punitive detention in Residential and Approved Schools. Some of the long-stay children at Wilkinson House were sent to us as the appropriate school (by I.Q.) and these, together with one or two of our children who were already in residence there, formed a compact gang who were together the whole 24 hours of each day and whose sole aim appeared to be to create as much disturbance as possible both in and out of school. So much disruption was caused to the normal working of the school that I was reluctantly compelled to redistribute the children in several classes and re-allocate Staff members. This was successful in its primary purpose within the school but had little effect outside. Feeling that it was grossly unfair for the rest of the children and for the Staff to be so disturbed by a mere handful of delinquents I suggested to Authority the advisability of diffusing such children rather than collecting them in one school but again found myself in a lone voice crying in the wilderness. Many of our children's difficulties arise initially from conditions in the home. During the year, in addition to the children referred to above, we had 12 children in care of the L.E.A. and 5 from the Orphanage—an all-time record.

The year was a settled one from the point of view of staffing. Absence through illness was at a minimum and it was never necessary to call in temporary teachers. One teacher returned from a special course in January and, due to the increase in numbers, another permanent teacher was appointed in August. Throughout the year some disturbance and a great deal of inconvenience was caused by the perpetual presence of workmen, completing unfinished work, starting new work which had been deferred, and carrying out repairs, some of them of a serious nature, which had been discovered or had developed after entry. The Senior children visited Preston Docks and, as a result, staged an excellent classroom display. Much of the time that would normally have been devoted to outside visits was devoted to visits to different parts of the buildings and grounds not normally used by the children and informal lessons given on the spot concerned with care

and maintenance. Much of the value of this work was negated by the dreadful state of the grounds. Owing to the non-appointment of even a part-time groundsman no attention whatsoever has been given to them. I understand that these were a feature of the school before we arrived but that is no longer so. We have a football field which has not yet been used on a single occasion either for organised games or general recreation !

During the year some 60 children attended the various baths for swimming instruction each week.

13 boys and four girls gained 'Learner' certificates, whilst eight boys and one girl gained 'Progress' certificates.

At one period during the season it appeared that the latter award was to be discontinued as a result of internal reorganization between the Blackburn Schools Athletic Association and the L.E.A. This possibility caused us very grave concern since we feel that a carefully graduated programme is particularly essential to the E.S.N. child in swimming as in any other activity. This is borne out by the results of previous seasons when our children produced astounding results in the examinations for Royal Life Savings Society awards. At that time the gradual progression from Learner and Progress continued to life saving through Elementary, Intermediate and on to Bronze Medallion level and our children always had an attainable goal at which to aim. These awards however, are no longer available so we were particularly grateful for the return of the 'Progress' certificate in its new form. The absence of this award for a period accounts for the low number gained during the season.

A new award made available to boys this year was the 'Personal Survival' certificate of the Amateur Swimming Association. Five of our older boys were successful in the examination for this at 'Bronze' level.

Lack of parental co-operation which we experience in other directions is causing increasing concern in connection with our swimming programme. It is accepted that some children experience a greater reluctance than others to attend swimming lessons and their various reasons are largely understood, but when sympathetic teachers have gone most of the way towards overcoming a child's particular reluctance it is more than a little disheartening to find that a parent has virtually undone all that has been done in her own child's interests. In some cases the parent is simply being over-protective whilst in others it is plainly a matter of taking the line of least resistance.

No matter what the reason may be it is none the less regrettable that parents should fail to take advantage of the facilities offered for swimming instruction, particularly in view of the frequency of press reports on juvenile deaths through drowning.

We are grateful to the L.E.A. for the facilities we enjoy, including transport and the services of sympathetic, qualified instructors, but feel we could provide a greater return for their outlay given a little more co-operation from certain parents.

In addition to the usual functions during the year—School Birthday Party, Film Shows, Cake Display, Carol Service and Christmas Party, the year was marked by the formal opening of the School by Mrs. Mason, the widow of the late Chairman of the L.E.A.

We still receive an unending stream of visiting students of various kinds, usually asking for information and the opportunity of "studying" individual children. This causes a certain amount of interference with the day-to-day working of the children and extra work and inconvenience for the Staff which, on the whole, is cheerfully accepted.

Full contact has been maintained with all the local services concerned with the welfare of children—unfortunately to an increasing extent with the Police Department, both C.I.D. and Liaison Officers. I am grateful to all concerned, in particular the Education Committee through the Chief Education Officer and his Staff and the Medical Officer and his Staff, for their co-operation and help.

Above all I would again call attention to the devoted, conscientious work of every member of my own Staff. In this kind of work far more is required than the ability to teach and I consider myself singularly fortunate to have such a band of colleagues and friends. I am extremely appreciative of their outstanding contributions to the life and work of the school, and for all their help and consideration so freely and cheerfully given to the children and myself.

HANDICAPPED PUPILS REQUIRING EDUCATION IN SPECIAL SCHOOLS
AT THE END OF THE YEAR.

Table 12.

	Blind	Deaf	Part'y Deaf	Physically Handicapped	Deli-justed	Malad-E.S.N.	E.Pil-epic	Speech Def'ts	Total
(i) Number of pupils requiring places in special schools :									
(a) day places	1	3	..	3	..	7
(b) boarding places	1	3	..	5	2	..	11
(ii) Number of pupils included at (i) who had not reached the age of 5 and were awaiting									
(a) day places
(b) boarding places
(iii) Number of pupils included at (i) who had reached the age of 5 but whose parents had refused consent to their admission to a special school..									
(a) day places
(b) boarding places.....	1	1	..	1	..	..	3

Analysis of Special Schools to which Blackburn Children have been admitted.

On 20th January, 1966, 328 children (184 boys and 144 girls) were in special schools as follows :—

		<i>Boys</i>	<i>Girls</i>
BLIND PUPILS			
Wavertree School, Liverpool	3	..	..
St. Vincent's, Liverpool	1	..	..
Henshaw's, Old Trafford .. .. .. .. ..	..	..	1
PARTIALLY SIGHTED PUPILS			
Partially Sighted Class, Corporation Park	2	..	—
DEAF PUPILS			
Mary Hare Grammar School, Newbury	—	..	1
Royal Cross School for the Deaf, Preston	2	..	8
St. John's, Boston Spa	1	..	—
Royal School, Old Trafford	1	..	—
PARTIALLY DEAF PUPILS			
Thomasson Memorial School, Bolton	3	..	1
Liverpool School, Birkdale	2	..	—
DELICATE PUPILS			
Lostock Open Air School, Bolton	—	..	2
St. John's School, Woodford Bridge	1	..	—
Black-a-Moor Open Air School	56	..	62
EDUCATIONALLY SUBNORMAL PUPILS			
Woodville, Longridge	—	..	1
Stone Cross, Ulverston	1	..	—
Rudolf Steiner, Ringwood	1	..	—
Crosshill Special School	84	..	54
Crowthorn, Bolton	3	..	—
Thingwall, Liverpool	—	..	1
Besford Court, Worcester	1	..	—
Aldwark Manor, Hull	1	..	—
Allerton Priory, Liverpool	—	..	2
Massey Hall, Warrington	—	..	1
Eden Grove, Appleby	1	..	—
MALADJUSTED			
Crosshill Special School	2	..	—
Pitt House, Devon	1	..	—
Wessington Court, Hereford	1	..	—
EPILEPTIC PUPILS			
Harrison Home, Maghull	—	..	1
Black-a-moor Open Air School	1	..	1
PHYSICALLY HANDICAPPED			
Chailey Heritage, Lewes	1	..	—
Black-a-moor Open Air School	11	..	7
Birtenshaw Hall, Bolton	—	..	1
Bradstock Lockett, Southport	2	..	—
Thomas De La Rue, Tonbridge	1	..	—

SECTION SIX

MISCELLANEOUS

Co-operation

Teachers, parents and School Welfare Officers have fully co-operated in the work of the School Medical department. To them my thanks are expressed.

National Society for the Prevention of Cruelty to Children.

Mr. D. J. Evans, Inspector of the Blackburn Branch, works in close association with the Department, and his continued help is much appreciated.

During the year 1965, seven cases were reported through the School Health Service, involving the welfare of fourteen children.

They all responded to warnings and advice.

Employment of Children and Young Persons.

School Medical Officers examined 774 children for employment during the year.

Three hundred and thirty-three children (239 boys and 94 girls) were newly licensed for employment out of school hours ; no children were licensed to take part in entertainments.

Deaths of School Children.

Tuberculosis	..	..	..	..	..	1
Leukaemia	..	..	..	..	..	1
Accidents	..	..	..	..	..	3

Nursery Classes.

There are thirty-three Nursery Classes in the Borough for the accommodation of children between the ages of three and five years. Inspection findings of children in attendance at these classes are incorporated in the appropriate group of Periodic Medical Inspection Tables.

The number of children on the rolls at the end of the year was 876.

School Nurses visit each Nursery Class at frequent regular intervals.

Physical Education.

I am indebted to the Chief Education Officer for the following Report on Physical Education in the Schools :—

In Blackburn, as elsewhere, the facilities for a good and enlightened programme of physical education vary enormously. In Secondary schools these facilities are improving rapidly as new school buildings and playing fields are completed ; but in the Primary Schools the improvement is slower and there are still many younger children who do not have the opportunity of enjoying organised games or free activities, either in a large outdoor space, or on a playing field. A few still do not have the use of an indoor space suitable for physical education. Despite these difficulties the teachers are enthusiastic and the standard of performance, whether indoors or out is steadily maintained.

Once again the Secondary Schools, have taken part in Lancashire and English Schools competitions and made good progress in Football, Athletics and Netball. This year the Girls' High School won both Senior and Junior Lancashire County netball rallies. With new playing fields at the new schools, more girls are now able to play hockey, as also do some boys. A keen interest is shown in cricket by both teachers and boys, but time is short for this major game and the climate unhelpful. The P.E. programme in Secondary schools is widening and emphasis is progressively laid on 'education for leisure' by the introduction of more activities which are likely to be of continuing interest to young people after leaving school. The Junior Schools have again held their League Competitions in football and netball and a most keen interest is shown in Area and Town sports.

In swimming, provision is made for each child to receive tuition for one or two sessions in the Primary school and the same, if possible, in the Secondary school. Excellent use is made of the limited time available and provision of transport to and from the baths has saved much valuable time in the schools. Though priority is given to teaching the beginners it has been possible again for the better swimmers to gain certificates for Personal Survival and Elementary Life Saving and to receive instruction in the four major swimming strokes.

The usual programme of recreative classes has taken place each week-day evening at the Harrison and Barton Street Gymnasia, and Keep-Fit classes, arranged by the People's College, are held at evening institutes throughout the winter sessions.

Milk Supplied to Schools.

The number of bottles (each containing $\frac{1}{2}$ -pint) supplied during the year, 1st January to 31st December, 1965, was as follows :—

(a)	Secondary Schools	691,584
(b)	Primary Schools	1,681,829
(c)	Special Schools	65,431
	(Blackmoor Open Air, Myope and Crosshill).	
(d)	Nurseries	20,270

School Meals Service.

Meals supplied to children during the year, 1st January to 31st December, 1965.

Primary and Secondary Schools :

	Free ..	105,416	
	Paid ..	1,675,099	
			1,780,515
Special Schools :	Free ..	5,599	
	Paid ..	38,799	
			44,398
Nursery :	Free ..	Nil.	
	Paid ..	19,561	
Gladstone Street :	.. ..	5,854	19,561
			5,854
			1,850,328

Average daily number fed during each month in 1965 :

January	10,595	May	10,688	September	10,850
February	10,625	June	10,028	October	10,878
March	10,462	July	10,150	November	10,518
April	10,589	August	66	December	10,774



MINISTRY OF EDUCATION

MEDICAL INSPECTION OF PUPILS ATTENDING MAINTAINED AND ASSISTED PRIMARY AND SECONDARY SCHOOLS

A. PERIODIC MEDICAL INSPECTIONS

Age Group	Number Inspected	Physical Condition		Requiring Treatment		
		Satisfactory	Unsatisfactory	Vision	Any other Condition	Individual Pupils
1961 and later	75	75	..	..	4	3
1960	411	411	..	24	81	95
1959	147	147	..	9	31	35
1958	54	54	..	1	9	10
1957	31	31	..	1	4	5
1956	4	4	..	3	..	3
1955	..	..	..	..	..	..
1954	721	721	..	85	56	132
1953	329	329	..	45	19	64
1952	..	..	..	..	..	..
1951	336	336	..	14	9	21
1950 and earlier	438	438	..	32	16	45
TOTAL ..	2546	2546	..	214	229	413

B. OTHER INSPECTIONS

Number of Special Inspections	..	..	..	..	1,527
Number of Re-Inspections	..	..	..	..	1,834
TOTAL	..	..	..	..	3,361

C. INFESTATION WITH VERMIN

- (i) Total number of individual examinations in the schools by the school nurses or other authorised persons 27,168
- (ii) Total number of individual pupils found to be infested .. 492
- (iii) Number of individual pupils in respect of whom Cleansing Notices were issued (Section 54(2), Education Act, 1944) .. Nil.
- (iv) Number of individual pupils in respect of whom Cleansing Orders were issued (Section 54(3), Education Act, 1944) .. Nil.

DEFECTS FOUND BY MEDICAL INSPECTION DURING THE YEAR

Table 13.

Defect Code No.	Defect or Disease	Periodic Inspections				Special Inspec- tions
		Entr'nts	Leavers	Others	Total	
4	Skin	T 3 O 1	7 —	20 —	30 1	22 —
5	Eyes— <i>a.</i> Vision . . .	T 32 O 12	46 1	136 2	214 15	33 —
	<i>b.</i> Squint . . .	T 11 O 1	1 —	— —	12 1	9 —
	<i>c.</i> Other . . .	T 1 O —	— —	2 —	3 —	— —
6	Ears— <i>a.</i> Hearing . . .	T 30 O 1	5 —	6 —	41 1	11 —
	<i>b.</i> Otitis Media . .	T 3 O 3	— —	1 —	4 3	1 —
	<i>c.</i> Other . . .	T 1 O —	— —	— —	1 —	2 —
7	Nose and Throat . . .	T 17 O 10	1 1	6 1	24 12	46 2
8	Speech	T 5 O 5	— —	1 —	6 5	2 —
9	Lymphatic Glands . . .	T — O 4	— —	1 —	1 4	— 2
10	Heart	T 2 O 3	— 1	1 1	3 5	1 —
11	Lungs	T 5 O 4	— 1	2 1	7 6	10 1
12	Development— <i>a.</i> Hernia	T 1 O 6	— —	1 4	2 4	— —
	<i>b.</i> Other . . .	T — O —	— 2	— 1	— 3	— —
13	Orthopaedic— <i>a.</i> Posture	T 1 O 1	— —	5 —	6 1	6 —
	<i>b.</i> Feet . . .	T 19 O 3	1 —	7 1	27 4	14 —
	<i>c.</i> Other . . .	T 9	—	2	11	4
14	Nervous System— <i>a.</i> Epilepsy . . .	T 1 O —	— —	— —	1 —	2 —
	<i>b.</i> Other . . .	T — O —	— —	— —	— —	— —
15	Psychological— <i>a.</i> Development . .	T 2 O 9	1 1	5 4	8 14	— —
	<i>b.</i> Stability . . .	T — O 1	— —	— 2	— 3	10 —
16	Abdomen	T 1 O 1	— —	— 1	1 2	— —
17	Other	T 5 O 4	8 3	10 4	23 11	14 8

TREATMENT OF PUPILS ATTENDING MAINTAINED AND ASSISTED PRIMARY AND SECONDARY SCHOOLS

GROUP A—EYE DISEASES, DEFECTIVE VISION AND SQUINT

	No. of cases known to have been dealt with
External and other, excluding errors of refraction and squint	23
Errors of refraction (including squint)	1889
TOTAL	1912
Number of pupils for whom spectacles were prescribed ..	914

GROUP B—DISEASES AND DEFECTS OF EAR, NOSE AND THROAT

	No. of cases known to have been dealt with
Received operative treatment— (a) for diseases of the ear	63
(b) for adenoids and chronic tonsillitis	369
(c) for other nose and throat conditions	92
Received other forms of treatment	244
Total	768
Total number of pupils in schools who are known to have been provided with hearing aids (a) in 1965	2
(b) in previous years	20

GROUP C—ORTHOPAEDIC AND POSTURAL DEFECTS

	No. of cases known to have been dealt with
(a) Pupils treated at clinics or out-patient departments	389
(b) Pupils treated at school for postural defects	77
Total	466

GROUP D.—DISEASES OF THE SKIN

						No. of cases known to have been dealt with
Ringworm— (i) Scalp						—
(ii) Body						3
Scabies						38
Impetigo						36
Other skin diseases						157
	TOTAL	..	..	..	..	234

GROUP E.—CHILD GUIDANCE TREATMENT

Number of pupils treated at Child Guidance Clinics under arrangements made by the Authority	64
--	----

GROUP F.—SPEECH THERAPY

Number of pupils treated by Speech Therapists under arrangements made by the Authority	84
---	----

GROUP G.—OTHER TREATMENT GIVEN

(a) Number of miscellaneous minor ailments treated by the Authority	434
(b) Pupils who received convalescent treatment under School Health Service arrangements	3
(c) Pupils who received B.C.G.	359
(d) Others— 1. Orthoptics*	437
2. Sunlight	142
3. Cleansing	492
4. Chiropody	123
5. Audiometry	2709
TOTAL (a—d)..	4,699

* In addition 441 Lancashire County Council pupils were dealt with during the year.

SCHOOL DENTAL SERVICE

1. Attendances and Treatment

	Ages 5 to 9	Ages 10 to 14	Ages 15 & over	Total
First Visits	1580	1362	230	3,172
Subsequent Visits	1082	1663	338	3,083
Total Visits	2662	3025	568	6,255
Additional courses of treatment commenced	34	55	13	102
Fillings in permanent teeth	797	1688	462	2,947
Fillings in deciduous teeth	596	32	—	628
Permanent teeth filled	641	1451	430	2,522
Deciduous teeth filled	553	28	—	581
Permanent teeth extracted	179	553	150	882
Deciduous teeth extracted	2144	563	—	2,707
General anaesthetics	375	207	38	620
Emergencies	500	244*	54	798

Number of Pupils X-rayed	121
Prophylaxis	104
Teeth otherwise conserved	—
Number of teeth root filled	1
Inlays	1
Crowns	1
Courses of treatment completed	2159

2. ORTHODONTICS

Cases remaining from previous year	75
New cases commenced during year	47
Cases completed during year	36
Cases discontinued during year	5
No. of removable appliances fitted	74
No. of fixed appliances fitted	3
Pupils referred to Hospital Consultant.. . .	<u>—</u>

3. PROSTHETICS

	5 to 9	10 to 14	15 and over	Total
Pupils supplied with F.U. or F.L. ..	—	—	—	—
(first time)				
Pupils supplied with other dentures ..	2	15	5	22
(first time)				
Number of dentures supplied	2	17	6	25

4. ANAESTHETICS

General Anaesthetics administered by Dental Officers ..	8
---	---

5. INSPECTIONS

(a) First inspection at school. Number of Pupils	12,792
(b) First inspection at clinic. Number of Pupils	476
Number of (a)+(b) found to require treatment	8,194
Number of (a)+(b) offered treatment	5,462
(c) Pupils re-inspected at school clinic	1,187
Number of (c) found to require treatment	631

6. SESSIONS

Sessions devoted to treatment	875
Sessions devoted to inspection	107
Sessions devoted to Dental Health Education	<u>—</u>

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THE USE OF THE PROGRAMMED LEARNING TECHNIQUE IN HEALTH EDUCATION

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The fundamental concepts of Instruction as a process of Communication and Control can be applied through the process of programmed learning. Programmed learning, through the media of teaching machines, has been shown over a period of years to be an effective and efficient tool in the hands of the educator. The use of programmed learning as a method of instruction in health education has not been the practice hitherto, so far as is known, in Great Britain. Observing the use of programmed learning to teach the concept of area in mathematics to young children, it occurred to the author of this article that here was a means of conveying useful health facts to children in an interesting way which could be carried out at group level and by its very *modus operandi* reinforce basic facts in the child's mind. With the collaboration of Mr. J. E. Cunliffe, Headmaster of St. Bartholomew's School, Blackburn, an experimental programme dealing with the relationship between smoking and lung cancer was compiled in 1964. Six hundred and twenty-seven children were given this programme to work through.

The object of the experiment was to show that programmed learning was a concept which was of practical use in health education, being a method of proved usefulness in other fields. Before discussing the experiment itself, it is proposed to give a few details concerning the concepts of communication and also the basis of programmed learning and its application to teaching machines. In theory, teaching takes place whenever the interaction of a person with his environment is controlled so as to make easier the acquiring of some knowledge or skill. In practice, it does not matter whether the control is exercised by the learner himself as in self-instruction, by another person as in conventional teaching, or in some other way as when using a teaching machine. Or, of course, one can employ any two or all three elements combined in one teaching situation. Lack of knowledge, or of skill, or the nature of the task itself, often prevent the learner from providing an effective control for himself. The provision of a teacher usually rectifies this situation.

In any teaching situation there is the store of knowledge to be imparted ; this is called the "subject matter store". In a situation where there is a teacher, this "subject matter store" is represented by the teacher's knowledge of the subject. The channel along which information is passed to the student forms the next component in the system of teaching and is called the "Display component". In practice this may be represented by the voice, for example, or by a blackboard, charts or slides. The display can be transmitted to any number of students and one may have any number of "Displays" as is the case with films and television programmes used for teaching purposes.

This is called an "open-ended system", and herein lies its drawback. Because it is "open-ended", information is not fed back to the instructor about the student, it does not tell him whether the information has been understood, or whether it has been absorbed, or whether modifications should be made in presentation. When the teacher does receive back information it is often too late for him to modify the teaching. Therefore, for a teaching system to be efficient there must be built into it some means of determining whether the information has been received and understood. For example, when teaching by means of a "Tutorial", this feed-back is possible. Such a system is known as a "closed-loop" situation.

Teaching machines are a means whereby the "Control" can be introduced without the use of a human instructor. The "closed-loop" system differs from the "open-ended" system in that, speaking in theoretical and not in physical terms, one has interposed in the system several mechanisms to overcome the lack of feed-back of information about the student's performance. These include a means of questioning the student and of evaluating his answer. These are called a "Response input" and "Response evaluator" respectively. The information so obtained is fed back into the machine. There is also included a means of selecting the information from the "subject matter store" to ensure maximum teaching efficiency. This very important element is called the "controller". The controller will determine what information is to be fed to the student and will base its decision on the student's present state of knowledge and on his past performance. This means that a component is also needed to provide a store of information regarding the student's performance ; this is called the "Performance store."

The "controller" is in effect the means of implementing rules governing the whole operation. A "teaching machine" is this set of rules and the means of implementing them. A teaching machine need not therefore be a "machine" in the physical sense at all ; it may range from a simple book to a complex electronic machine.

In the experiment about to be described it took the form of a series of cards ($5\frac{1}{2}$ -in. \times $3\frac{1}{2}$ -ins.), and a number of diagrams, models, and specimens. A teaching machine contains a carefully prepared text which is termed the "programme". Each individual item of the programme is termed a "frame". The student is required to respond to the machine by answering a question.

Several different types of programmes have been devised and different machines to implement them. It is not intended to describe here in detail the different kinds of programmes or to discuss the relative merits of each. Such programmes include those known as Skinner Linear Programme, the Pressey Linear Programme, the Crowder Branching Programme, and the Sheffield Branching Programme. The Programme type used in the experiment described here was the Skinner Linear Programme type. Here a series of small and relatively easy steps from one fact to the next are compiled. These frames are so constructed that the learner can only make a few errors. This eliminates the need for remedial procedure. The

Figure 1
Open-ended system of teaching

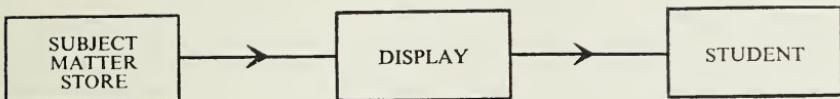
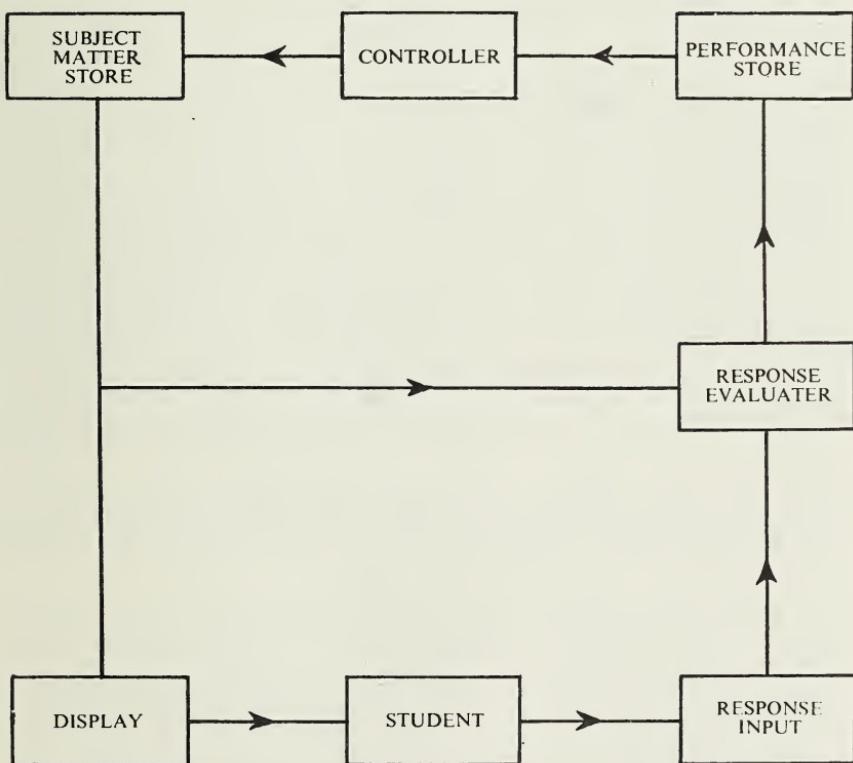


Figure 2.
Closed-loop system of teaching



sequence of items is presented to the student in a fixed order, hence the term linear programme. Each student has to make a response indicating that he has understood the question. The responses in this linear system are chosen by the student himself and not selected from a set of given alternatives as in some other programmes. When he has responded by recording his answer, the machine displays the correct answer so that he can tell whether his answer was correct or not. The same material is presented to each student but the programme is completed at different rates depending on the student's abilities. In the Skinner Linear Programme the student may or may not provide his own control. In the experiment described each child provided his own control, that is of reading the items in the prescribed order and providing his own response or answer, and recording it, before looking at the correct answer. A machine can of course prevent the sequence being tampered with and making it impossible to check the answer before recording the response.

The object of the learning machine programme was to convey to the child the relationship between smoking and lung cancer. Because it was desirable that the programme should not take longer than an ordinary school period to work through, it was necessary to restrict oneself to material that would not occupy the child for more than 35 minutes. This extended the usefulness of the technique by permitting the programme to be carried out within the ordinary school timetable. This being so a lot of information had to be omitted as had the relationship between smoking and diseases other than lung cancer. Botanical and geographical information concerning tobacco, though of interest to the child, had, of necessity to be excluded from the programme. As a matter of policy it was decided that the information given would be factual and unequivocal, but not advisory in nature. It was decided to include the use of the teaching machine in a health education campaign on smoking and health which was conducted in three schools in June and July of 1964. The schools were a Junior Mixed School, a Secondary Modern Co-educational School, and a Secondary Modern School for girls. As the campaign included a talk by a chest specialist, a talk by the school medical officer, a film, discussion groups, an essay competition, and in the Junior School a poster competition as well, information not given in the teaching machine programme yet obviously important in a campaign of this sort could be given to the child.

The Linear programme dealt with the following topics in the order given : cost of smoking, purchasing power of money equivalent, reasons people give for stopping smoking, reason people give for starting smoking, reasons given by non-smokers, the physical properties of tobacco, the effect of these properties on body tissues, the parts of the body involved, the appearance of healthy and diseased lungs, the action of a cell, the nature of cancer, the effects of chronic irritation on tissues, the chemical constituents of tobacco, the relationship of these constituents to disease, the results of breakdown of lung function and the effect on the mechanism of breathing, the physical factors behind death from lung cancer, and the chances of developing lung cancer in relationship to the quantity smoked. The terminology was kept as simple as possible and no data was provided that could not be checked against authoritative references. Facts concerning

the cost of cigarettes had perforce to be placed at the beginning of the programme to avoid break of continuity, or if placed at the end, an anticlimax at the sequel. Such an introduction to the programme, with frames dealing with cost, gives prominence to something one feels medically, at any rate, to be a factor of lesser importance though perhaps appealing particularly to those who keep their brain in their pockets. Medical facts had to be limited to what was necessary to convey the theme that we were trying to impart.

The programme was printed on cards measuring $5\frac{1}{2}$ -in. \times $3\frac{1}{2}$ -in. On the front of each card was the "frame" or question. Underneath this was printed clue letters in the answer with "dashes" representing the missing letters of the answer. The answers were numbered from 1 to 67, some cards bearing more than one question. The child was given three foolscap sheets with numbered spaces for him to write in the answers, reproduced as on the front of the cards. By turning his card over the child could check if his answer was correct, as the answer and its reference number were given on the back. In practice the children were content not to turn the answer up first. The incentive to do so had been removed ; in the brief introduction to the teaching machine at the beginning of the "period" their attention was drawn to this fact. Arranged round the room were a series of peg-board screens bearing information either in the form of charts, specimens, or models. Some examples of items on these screens were cigarette packets of varying prices, articles that a child might buy such as nylon stockings and gramophone records, specimens of normal lung and carcinoma of the lung, charts showing typical comments made by smokers and non-smokers, graphs of mortality rates, and a model using balloons showing the effect of bronchial constriction and pulmonary collapse. A vacuum-operated smoking machine provided a demonstration of the collection of stain from cigarette smoke on a cloth filter. The child read the question, sought for and studied the appropriate information on the screen, wrote his answer on the paper, turned his card over, checked his answer with the correct one, and then read the next card (or "frame").

One of the problems in compiling the programme was the choice of wording for the questions. As in this experiment it was planned to use the same programme over the age range of 9 years to 15 plus, with both sexes and with all ranges of intelligence, a relatively simple wording had to be aimed at, yet one which did not insult the intelligence of the older children. Analogies were used when dealing with the nature of cells and of cancer. This article is primarily concerned with the principle of the use of programmed learning in health education and not in the details of the programme itself which in any case, in the light of experience, one would modify for future use. Time trials with a pilot group eliminated many original frames and rectified ambiguous wording. Examples of four "frames" are given below :—

- | | | |
|---------|--|---------------|
| CARD 15 | Look at the table showing the burning cigarette.
What is happening to the cloth ?
It is being (17) dis ----- d | (discoloured) |
| CARD 16 | What causes this discoloration ?
(18) N - c ----- | (Nicotine) |

- CARD 17 If smoke is inhaled, what internal parts of the body will be affected ?
 The (19) b --- ch - (Bronchi)
 (20) l ----- (Lungs)
 (21) g -- (Gut)
- CARD 18 Look and compare the two jars.
 Jar A shows (22) he ----- (Healthy)
 Jar B shows (23) dis ----- tissue. (diseased)

The programme was used by 627 children and their age-sex distribution is given in Table I. At the outset it was decided that a controlled experiment was impracticable under the circumstances and this therefore prevents a scientifically exact evaluation of the success of the experiment. However, many scientific workers have proved the efficiency of programmed learning in education, notably amongst them Dr. Skinner of Harvard University, and the Universities of Aberdeen and Sheffield are pioneering research in programmed learning in this country. It is submitted that it would be fair to say this experimental use of programmed learning in health education was satisfactory if the experiment satisfied the following criteria :—

- (i) The use of principle of proved educational worth.
- (ii) Practicability.
- (iii) Evidence of fact absorption.
- (iv) Participant acceptability and interest.

TABLE I

Age/Sex distribution of children participating in programmed learning experiment.

Age	9	10	11	12	13	14	15	16	Total
Boys	—	7	17	64	74	65	7	2	236
Girls	3	6	25	106	93	107	51	—	391
TOTAL	3	13	42	170	167	172	58	2	627

The first criterion, that of the use of a principle of proved educational worth, is self-evident from what has been said above. The comments of independent observers who were trained educationalists, coupled with the observations of those involved in the experiment, agree that the use of the teaching machine is a practical proposition in health education. The use of the discussion groups, question time, and essay competition gave evidence of the absorption of facts which were known to have been given only through the teaching machine and not in other sections of the health education programme. The fourth criterion, that of participant acceptability and interest was shown quite markedly, although one has of course to allow for the novelty of the situation for the child. The fact that the child was doing something for himself in the mechanical sense as well as an intellectual one acted as a stimulant for him. Admittedly there were a number of 15 and 16-year-olds who felt the questions too childish for them. The use of one programme over so wide an age range is of doubtful advisability.

The fact that each child could work at his own pace meant that slower ones were not under pressure and brighter children not frustrated by a slow pace. All the slower children did not complete the programme within the period of 35 minutes but they doubtless gained some value from it.

It is felt that programmed learning, if the interest shown by the children in this experiment is anything to judge by, is a useful means of giving information concerning health. It combines the advantages of being accurate, efficient, interesting to the instructed, needing the minimum of trained personnel, available for small or large groups, and above all, of being based on sound educational principles. It is felt that programmed learning and the use of teaching machines should be extended into the field of health education.

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COUNTY BOROUGH OF BLACKBURN HEALTH AND WELFARE DEPARTMENT

ST. HILDA'S SCHOOL OUTBREAK - 1965

On Thursday, 7th October, 1965, eighty-five school girls and one teacher became ill at St. Hilda's Secondary Modern School for Girls and were admitted to hospital by ambulance. The school was closed for the remainder of the week and clinical and epidemiological investigations instituted. The school re-opened the following Monday, 11th October. On this day fifty-five girls became ill and were admitted to hospital. Twenty-three of these girls were re-admissions. In all, one hundred and eighteen girls were admitted to hospital during the outbreak.

Preliminary investigations clearly demonstrated that the problem was one of obscure origin. The investigations were extensive and full use was made of specialist advisers in a number of scientific disciplines. Six specialist laboratories co-operated in the investigation and a computer was employed in an analysis of some of the data.

The environmental investigations were assisted greatly by making full use under medical direction of staff and specialised equipment of other local authority departments, such as the Fire Brigade, Engineers, Police, Architects and Building departments. The initial clinical investigation of the cases and the direction of the epidemiological investigations were conducted by the Health and Welfare Department. The hospital investigation was conducted by the Consultant Paediatrician to the Blackburn Group Hospitals and the psychological survey by a psychiatrist of the Middlesex Hospital, University of London.

On Wednesday, 6th October, 1965, H.R.H. Princess Margaret was expected to attend a ceremony of re-dedication at Blackburn Cathedral. Girls and boys from several schools were assembled outside and inside the Cathedral to see the Princess. The day was particularly warm, humid and sunny and the girls from St. Hilda's school took their allotted places early in the morning and stood in position for 2—3 hours because the Princess was unfortunately delayed by fog. Some of the girls had had no breakfast, all missed their morning school milk and were virtually without supportive beverages or rest for the full period of the morning session.

Eye witnesses stated that about 140 girls became ill. Twenty-five collapsed in what at first appeared to be a simple faint but which manifested other signs and symptoms of an unusual nature and merited a number being taken by ambulance to the Blackburn Infirmary Casualty department. The attacks were associated with some tachycardia, rapid respiration, hyperventilation and spasm of muscles and abdominal discomfort.

The Health Department was not notified of the incident at the Cathedral at the time of its occurrence, and the evidence was, therefore, obtained retrospectively. The children present in the Cathedral precincts were from four Church of England schools. These were a secondary modern school for boys, two junior mixed schools and St. Hilda's secondary modern school for girls. A small number of children from other schools were also

present. In addition to the St. Hilda's girls there were, therefore, present 400 boys aged 11 years to 16+ years and 44 boys and 45 girls aged 7 years to 11 years, a total of 489 children. With the exception of one ten year old boy who fainted, no cases of illness were reported from the other three schools. All the children who were ill attended St. Hilda's school.

CLINICAL SIGNS AND SYMPTOMS EXHIBITED AT THE SCHOOL.

Shortly before noon on Thursday, 7th October, the Headmistress of St. Hilda's School reported to the Health Department that an abnormal number of girls were collapsing. At 12.5 p.m. the School Medical Officer, accompanied by a nurse, arrived at the school and found about thirty-six girls laid out on the assembly hall floor in a state of collapse. A girl had complained of feeling ill in the morning assembly and a few more had complained later in the morning, but in a school of 589 girls there is nothing unusual in this. It was not until a crescendo of cases had developed that it was apparent there was something unusual occurring.

The clinical picture observed by the medical officer at the school was remarkably consistent. For several hours prior to collapsing the girls had felt generally unwell with abdominal discomfort and nausea. Later they experienced a sudden sharp pain in the chest. In many cases the left side was specified. In a number of cases this caused them to fall to the floor. They next experienced difficulty in breathing. This was followed by the development of rapid respirations. The extremities became cold and moist and the pulse was weak.

About thirty of the girls proceeded to develop tetanic spasm with spastic contracture of all four limbs and of the facial muscles. Pronounced carpopedal spasm developed in quite a number of the girls. Active or passive extension of the finger joints was impossible. Plantar flexion of the feet occurred and the spasm of the facial muscles caused difficulty with speech. The reflexes were not easily elicited and were sluggish. These girls then went into a coma for five to ten minutes during which time the muscles gradually relaxed. At no stage was there any vomiting and no diarrhoea or abnormal bowel movements. Many girls had a desire to micturate but there was no urinary or faecal incontinence. There was no marked colour change of the skin. Pallor was slight except in the case of one unconscious girl who developed total apnoea with no discernible pulse, and in this case the pallor was extreme. No cyanosis was observed.

It was interesting to note identical symptomatology occurring in the same sequence in girls who had not been in contact with one another. One girl collapsed in a swimming bath off the school premises at the same time as girls were collapsing in the school. Another girl was observed to fall on a concrete floor against an iron radiator complaining of sudden pain in the chest. She later developed the symptoms which appeared to be typical of those occurring in the girls. Her behaviour appeared involuntary..

Originally it had been decided to transport the six most severe cases to Park Lee Hospital to be examined by the Consultant Paediatrician for an immediate assessment and a decision reached on the method of dealing with all of the cases. It was at this time suspected that the girls might be suffering from an atypical virus infection. When the extent of the involvement amongst the girls became apparent it was decided to admit

all who appeared to have the signs and symptoms of the complaint. Seven ambulances made twenty-one journeys to Park Lee Hospital on 7th October with eighty-five girls and one school teacher. The girls' ages ranged from eleven to sixteen years. Of the eighty-five girls admitted, thirty-four were detained and fifty-one discharged later in the day after all had been examined by the Consultant Paediatrician. The school teacher involved was also discharged the same day. In addition, a further thirteen girls were sent home by ambulance from the school as they were considered to be suffering from shock. A peak number of sixty girls were at one time lying collapsed on the assembly hall floor and the scene resembled a battlefield without the blood. It was understandable that a number of girls would become clinically shocked. Some of the girls helping their school mates became ill at a later stage. By two o'clock the last girl had been transported to hospital and the other girls sent home.

Between the closing of the school on the afternoon of Thursday, 7th October, and its re-opening on Monday, 11th October, a number of girls collapsed at home or in the street and were admitted to hospital. Several of these girls had developed attacks of tetanic spasm.

The school teacher involved also complained of muscle spasm whilst at home during the night of 7th October.

When the school re-opened on the following Monday, 11th October, the School Medical Officer found that once again the girls were collapsing. This time the symptoms were less severe. On this occasion the opportunity was taken to record the girls' history on a pocket-sized tape recorder at the time of examination. The principal complaints on the Monday were of coldness, shivering, abdominal discomfort, nausea, headaches (mainly frontal) dizziness, "pins and needles" in the limbs, and stiffness of the limbs. Only isolated cases of spasm were seen at this stage. Again there was no vomiting or the passage of abnormal stools. This time fifty-five cases were admitted to Park Lee Hospital by ambulance and the school closed. Of these girls, thirty-one were discharged during the day and twenty-four detained. However, by nine o'clock the next morning the number of girls in hospital had increased to forty-three as further admissions of ill girls had occurred from their homes and in some cases they had been picked up in the street.

The total number of girls affected in this outbreak was one hundred and eighteen. One school teacher, a woman of forty-six, was also involved. It was considered at the time of the girls' collapse that they could be classified into five groups :

- (1) organically ill
- (2) clinically shocked
- (3) malingeringers
- (4) organically ill and hysterical
- (5) with hysteria

FIGURE 1.

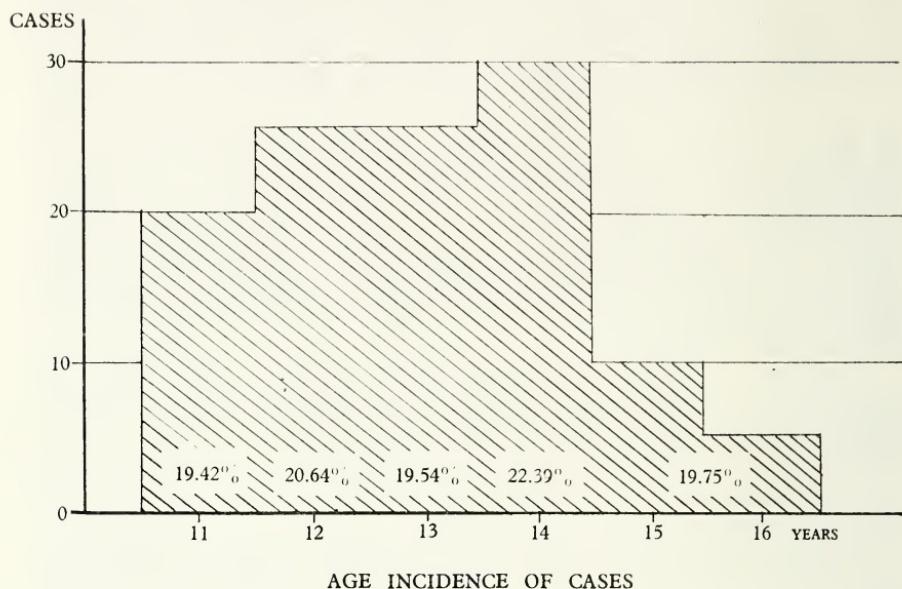


FIGURE 2

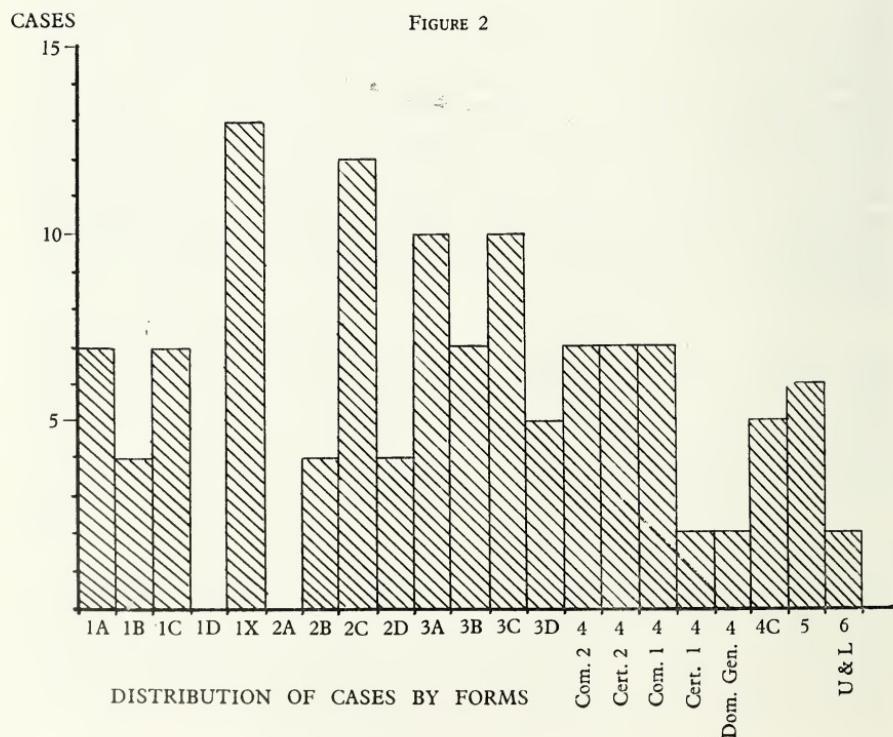


FIGURE 3

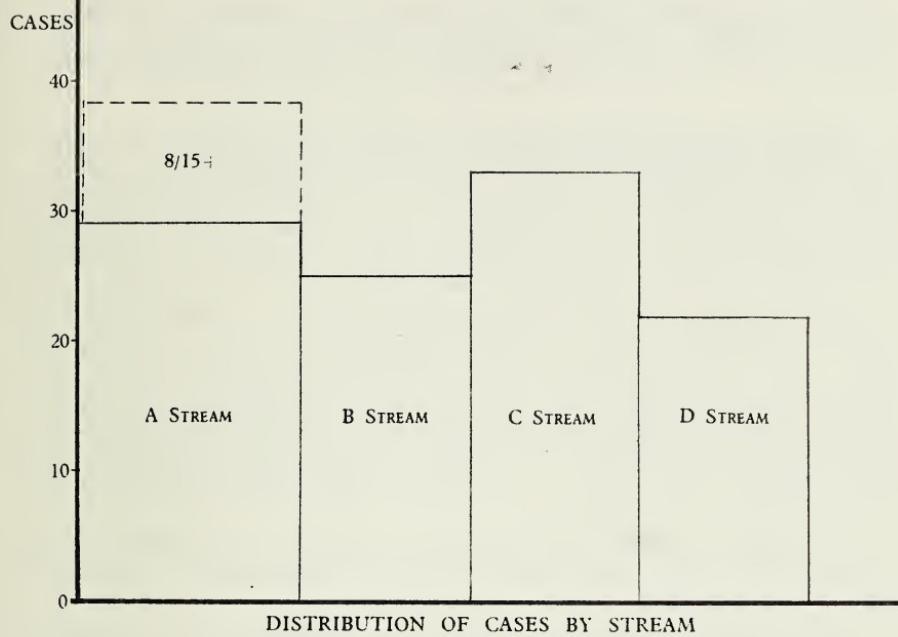
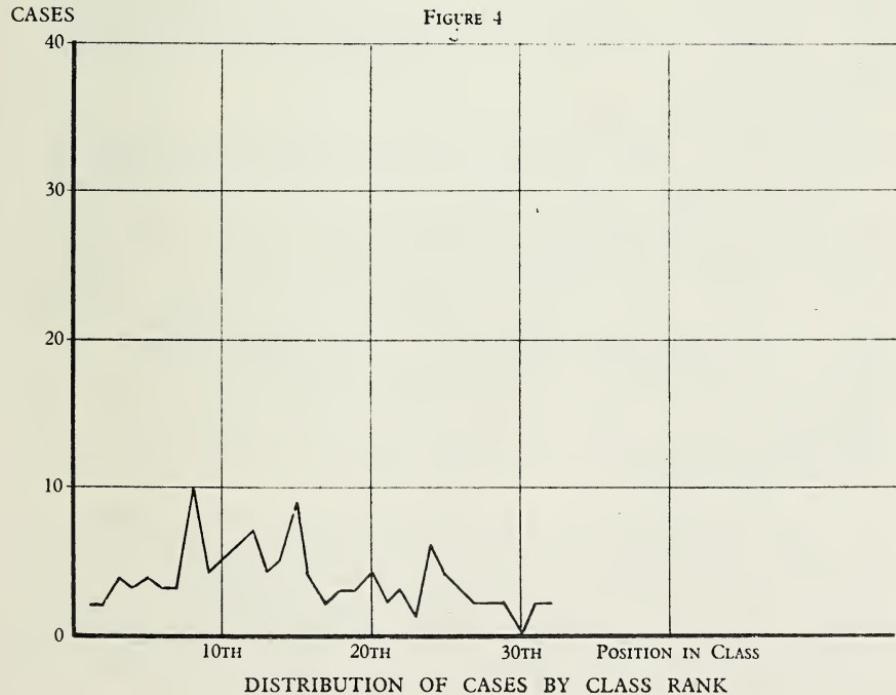


FIGURE 4



INVESTIGATION INTO THE POSSIBLE SOURCE OF AN INFECTIOUS OR TOXIC AGENT IN THE ENVIRONMENT

Extensive routine investigations were immediately carried out at the school by a team of public health inspectors under the direction of the School Medical Officer. Every corner of the school precincts was thoroughly inspected including under-floor spaces. Experts in different fields were called in where necessary. A large number of samples were collected and sent to the six laboratories co-operating in this investigation.

A conference was held with all members of the teaching staff. No teacher could describe any common denominator amongst the affected girls. The 118 girls affected in this outbreak were between the ages of eleven and sixteen, that is, the whole age range of the school. They represented 20% of the school roll of 589 girls. The number of girls involved who were 11, 12, 13 and 14 years ranged between 20 and 30 for each age group (figure 1). As this is a secondary modern school, few girls stay beyond the age of 15 years.

Therefore, 10 affected fifteen year olds and 6 sixteen year olds is as representative a proportion of affected to unaffected girls as was found lower down the school.

If one refers to figure 2 which gives the distribution of girls by form, the affected girls were distributed throughout all the forms in the school except 1D and 2A. This implies that at the time of the development of signs and symptoms in the school, the girls were geographically distributed evenly throughout the school building. Any agent involved in the school must therefore affect the whole school building or an area common to all forms in the school.

The school is divided into four streams, A, B, C and D, in descending order of intellectual merit. If one studies figure 3 which gives the distribution of the cases by stream, they are seen to be fairly evenly distributed throughout all four streams. Those affected were therefore drawn equally from all intellectual levels. If one takes the result achieved by each affected girl in the Christmas Examinations in 1965, or an estimated position if she was absent for this examination, one can assess the rank of each in her own class. In figure 4, each affected girl is grouped with girls who achieved the same class position in their respective classes. It is thus seen that the affected girls occupied all positions from the 1st to the 29th positions in their classes, with a greater number achieving 8th to 16th places in class. This would suggest, taken in conjunction with the information given in figure 3, that the affected girls were drawn fairly equally from all intellectual levels.

The sickness rate for the previous three weeks was analysed and found to be within normal limits. If a girl had been absent at any time during the previous three weeks she was visited at home by a Health Visitor and her history recorded. No valuable information was revealed by this investigation. The one departure from normal was the collapse of the girls from St. Hilda's School on the previous day to the outbreak, Wednesday, 6th October, during the visit of H.R.H. The Princess Margaret.

Certain investigations were carried through urgently so that by the end of the week the whole school could be fumigated and the week commencing Monday, 18th October, employed in cleaning the school from end to end and finalising the investigations.

A vast number of potential causes could be advanced as possibly contributing to the outbreak and these were classified as either organic or functional or a combination of both, under the following schedule as a scheme to give direction to the investigations :

"A" SCHEDULE

- (a) Ingestion : (i) Food poisoning chemical infective
(ii) Taking of drugs
(iii) Infestation
and requiring examination of school meals, school milk, tuck shop stores, fruit drinks, iced lollies, etc. Elimination of possibility Trichinosis, Ergot poisoning, botulism, solanine poisoning, and heavy metals and Cadmium, etc.

(b) Inhalation : (i) Fumes from central heating
(ii) Fumes from paints containing irritants or insecticides
(iii) Fumes from contiguous industrial processes
(iv) Arsenical vapours from fungus breakdown of pigments

(c) Injection : (i) Insect bites
(ii) Hypodermic
(iii) Through abrasion from toxic agents in garments

(d) Invasion : (i) By bacteria fungus or parasite
(ii) By virus or other agent producing encephalitis

(e) Intent : (i) As consequence of ill-conceived games
(ii) As exploitation for gain of situation

(f) Individual Neurosis : (i) Conditioning
(ii) Stress
(iii) Group activity

PROGRESS OF THE INVESTIGATION AS PER THE SCHEDULE

INGESTION

Almost invariably poisoning by ingestion is characterised by irritative symptoms in the intestinal tract with nausea, vomiting and possibly diarrhoea. Irritation of the gastro-intestinal tract was conspicuous by its absence, nor was there any irritation, soreness or metallic sensation in the mouth. Only 430 had school meals on Monday, 4th October, and 416 on Tuesday, 5th October. Many of the affected girls were those who did *not* partake of the meals. No meal had been taken at school by any girl on the day of the Princess's visit, nor had any taken school milk. Teachers and 6th form girls who did partake of school meals on the Monday and Tuesday prior to the Wednesday incident were unaffected. The kitchen and its contents were carefully examined and samples of food stocks, water and milk submitted for analysis with the following results :

Biscuits—

Arsenic

Majestic wafer, digestive and chocolate fingers ..	0.5 p.p.m. only
Digestive 'Granola', Abbey, fruit shortcake ..	Nil.
Custard cream, orange cream and Zodiac ..	Nil.

<i>Crisps</i>	Less than 1 p.p.m.
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Water sample	Lead, copper, zinc, tin	..	Nil.
Apples (Green)	Pesticides Nil.	Lead	..
Carrots	" "	" "	Nil.
Onions	" "	" "	Nil.
Potatoes	" "	" "	Nil.
Apples (Red)	" "	" "	Nil.
Flour	.. . . . . . . . . .	..	Less than 0.5 p.p.m.

Milk : Antibiotics, Nil. Lead, copper, zinc, absent. Arsenic absent
Chemical Composition.

	<i>Fat</i>	<i>Non-fatty Milk solids</i>	<i>Total milk solids</i>
Sample 1	.. 3.80	.. 8.75	.. 12.55
Sample 2	.. 3.70	.. 8.70	.. 12.40
Sample 3	.. 3.80	.. 8.75	.. 12.55

Satisfactorily pasteurised.

Bacteriological Sample of Water

Sample 1	..	0	..	0	Highly satisfactory
Sample 2	..	0	..	0	do.

The milk at the school is pasteurised, and is part of a bulk supply from a 2,000 gallon container supplying not only St. Hilda's but other schools in Blackburn at which all pupils were unaffected. Many of the St. Hilda's children affected by the incident did *not* take school milk. Of the meat used for meals Monday 4th, Tuesday 5th and Wednesday 6th October, there were two deliveries on Monday and Tuesday. The Monday delivery was used partly for the Monday meal and partly for Tuesday, Tuesday's part being

stored in the refrigerator overnight and then cooked on Tuesday. It is the practice not to use left-overs and these were destroyed. On Tuesday, meat was cooked for the Wednesday lunch and was left and served cold with salad which was well-washed in town supply drinking water.

Neither sausages nor pork appeared on the menus for the school meals so that *Trichinosis* seemed to be unlikely as a cause, particularly as there were a series of onsets ; there appeared to be no pyrexia, oedema of the eyes was absent, gastro-intestinal irritation was entirely absent and there was no intense muscular pain.

Botulism—Tinned meat and pastes were not used in any of the meals, nor olives nor vegetables likely to be associated with this disease. The phasic nature of the outbreak also is a strong reason to exclude this.

Solanine poisoning—The classical symptoms with vomiting and diarrhoea, severe headache, hallucinations and suppression of urine were fortunately absent. Sprouting potatoes were not used, nor were potatoes served in their jackets.

Ergot poisoning—Rye flour was not used at the school and therefore the fungus *claviceps purpurea* was unlikely to be encountered. Vomiting and acute abdominal pain were absent, also severe thirst convulsions and mania. Discolouration of the extremities with threatened gangrene was also absent.

Cadmium and metallic poisons—Citrus fruit juices were never at any time served from plated containers where the acid would have dissolved out cadmium or other glazes. Vomiting and cramps of the character seen in such poisonings were not symptomatic of the St. Hilda's outbreak. Iced lollies which might cause this type of hazard were not available to the school exclusively and if such had been purchased locally and had been responsible they would have involved other children using the local shops and such was not the case.

Taking of Drugs—The general run of drugs taken for 'kicks' by foolish adolescents is unlikely to have precipitated the symptoms seen at St. Hilda's and many of the girls are far too responsible to allow themselves to be persuaded to indulge in this stupidity. One girl had been receiving tablets from some man from a nearby area and this matter was referred to the Police for action. This girl was re-admitted to the hospital after taking a sedative drug in an overdose. She was a Child Guidance Clinic patient.

Inhalation—Although the full central heating system was not in operation on the day of onset of the incident certainly the unit producing hot water was and some fumes from the solid fuel burning boiler could be detected in the main corridor of the school when the wind was in the appropriate direction. This is due to the fact that when the school conversion was made originally a communicating door was left from the boiler room into the side of the corridor. It is possible therefore that when the draught is shut down in the boilers and there is inadequate oxygenation of the coke bed pungent fume may be blown through the boiler room into the corridor of the school. Running the heating system on test under conditions prevailing at the time of the outbreak produced a maximum level of approximately 30 p.p.m. carbon monoxide.

The school had been repainted in the past year but the paint had long

since matured and hardened and seemed unlikely to be emitting any toxic fume and certainly there was no evidence of overheating from the central heating driving off such vapours. The paint did not particularly contain toxic fly repellents and insecticides.

MYCOLOGICAL INVESTIGATION.

A heavy growth of mould was discovered in the space beneath the assembly hall stage. It is known that certain moulds are arsenic disrupters. They act on green paint to liberate trimethyl arsine. Some months previously, thieves had stolen lead flashing from the roof. This had caused flooding of the sub-stage area. The space was ill-ventilated. One trapdoor opened into the main hall, the other into the entrance passage. All girls therefore had access to the areas adjacent to the entrances to the sub-stage space. The area itself was kept locked and had only been opened on two occasions in recent months. On 27th September, several girls had removed some of the chairs stored there. After a twist and shake session in the hall, accompanied by the inevitable raising of dust, the chairs had been returned on 30th September. These girls were not affected in the outbreak. In addition to the chairs covered with mould, there were articles of clothing and stage properties in a similar condition.

Samples of the mould and paintwork were taken from the sub-stage area. The Public Analyst's Laboratory at Burnley reported that some paintwork contained twenty parts per million of arsenic. If an arsenic disrupter were present there was sufficient paintwork containing this high quantity of arsenic for the production of arsine. Among known arsenic disrupter moulds are *Scopulariopsis brevicaulis*, *Aspergillus sydowi* and *Paecilomyces*. Leeds University Department of Mycology isolated a number of moulds from the sub-stage area and a search was made for the presence of these known arsenic disrupters or for closely allied moulds.

A large quantity of penicillium mould was present. It was found on the chairs, the blind material and on other objects. *Scopulariopsis brevicaulis* is a member of the penicillium family. As the cultures developed, a search was made for spore formation that would be diagnostic for *Scopulariopsis brevicaulis*. However, this member of the family did not appear on the culture plates. *Aspergillus versicolour*, related to *Aspergillus sydowi*, was isolated from the green blind material. There was sufficient quantity of this blind material stored to cover all the skylights in the assembly hall. It was cultured on Czapek Agar medium and by adding 0.1% arsenic trioxide to the medium an attempt was made to detect trimethyl arsine. A culture on Czapek Agar medium without arsenic trioxide was used as a control. A smell of garlic is stated to be characteristic of trimethyl arsine produced by some moulds. It was suspected that there was a smell of garlic from the *Aspergillus versicolor* growing on Czapek Agar with 0.1% arsenic trioxide. This was not confirmed by analysis of the air collected in a bell-jar placed over the culture. The contents of the sub-stage area were vigorously disturbed to raise a cloud of mould dust. The air was pumped from the area through a solution of mercuric chloride. This test was negative for arsenuretted hydrogen or arsine. It was concluded that there was no evidence of toxic substances emanating from the sub-stage area.

Paint on various articles from the stage space was submitted for analysis with the following results :

Paint on hardboard and paper board	.. ..	1 p.p.m.
Paint on scrapings	.. ..	15 p.p.m.
Rags - flock, etc.	.. ..	1.5 p.p.m.
Cloth (fawn) no paint	.. ..	0.5 p.p.m.
Green cloth (coarse linen)	.. ..	0.2 p.p.m.
Wood painted green (fragments)	.. ..	Nil.
Wood painted green (large piece)	.. ..	20 p.p.m.
Green cloth (wool)	.. ..	1 p.p.m.

Industrial hazard when investigated was equally interesting. Two main industrial units are immediately adjacent to the school yard and both produce toxic material capable of being inhaled with injury to health.

The problem was approached from two angles. Looking backwards one searched for a chain of events that could have produced this clinical picture. Looking forwards one searched for clues in the environment that could have produced a chain of events leading to these signs and symptoms. This 'backwards forwards approach' eliminated possible loss of environmental data that would be irrecoverable if the clinical picture or laboratory investigations at a later stage pointed to a particular factor. Reviewing the clinical signs and symptoms one was led to the hypothesis of the cause being one of aromatic hydrocarbon poisoning.

Nelson, in his textbook of Paediatrics, summarises aromatic hydrocarbon poisoning as follows : (ref 2)

Aromatic Hydrocarbons

These materials are very toxic. Most of them contain benzene, toluene or xylene. They are present in sludge solvents, lacquer thinners, carbon solvents, paint and varnish removers, paint thinners, stencil solvents and thinners and gum or resin thinners.

Symptoms

Symptoms occur after accidental ingestion, from absorption through the skin or from inhalation of vapours in closed rooms. Most of these aromatics produce a preliminary period of excitement and restlessness. This phase may be followed by a severe central nervous system depression resulting in death. Rapid respiration, tachycardia, hyperventilation and resultant tetany may be observed.

Nelson, W. E. Textbooks of Paediatrics
6th Ed. 1954, p. 615

To test this hypothesis a search was made for a source of aromatic hydrocarbons and a connecting link between the source and the school.

On enquiry it was found that an iron foundry adjoining the school had lost a quantity of aromatic hydrocarbon. At a point adjacent to the school wall a phosphating process was conducted. Castings were dipped into a degreaser containing known aromatic hydrocarbons, passed momentarily through a water tank and into a tank containing phosphoric acid. The phosphoric acid tank was never emptied and had a fluid seal on top of

the phosphoric acid. Inevitably some aromatic hydrocarbon was carried over on the casting into the tank and increased in concentration as time went on. This tank then contained a mixture of aromatic hydrocarbon and phosphoric acid ; seven weeks before the outbreak occurred 84-gallons of the mixture leaked from this tank over a period of 14 days.

A second concern, a small wood treatment plant, had premises abutting into the school precincts. It was found that wood shavings impregnated with preservative improperly burnt in a stove caused aromatic hydrocarbons to be distilled off into the air. The small chimney was adjacent to the school wall. A small plastic tube passed up to its outlet enabled flue gases to be pumped through a reagent. The test was strongly positive for aromatic hydrocarbons. Charred wood shavings were found in the school playground. The caretaker had not seen them there before. Fresh shavings when burnt in the laboratory produced a strong positive reaction for aromatic hydrocarbons.

Two sources of aromatic hydrocarbons had now been found. It was now necessary to discover whether they could have contaminated the school.

At this point it is necessary to study the history of the school buildings. The school was converted from a cotton weaving mill in 1938. The conversion was carried out very efficiently and the school buildings are of a high standard for a non-purpose built school. A five storey central block was reduced to three storeys and converted to classrooms. The two weaving sheds had their roofs removed and were turned into playgrounds. The wing formerly occupied by offices was turned into the headmistress' study and waiting room. An assembly hall was built along one wall of one weaving shed and a gymnasium along the opposite wall. Therefore, the west playground was bounded by a three storey block on one side, a gymnasium on the second side, an assembly hall on the third side and on the remaining fourth side the wall of the original weaving shed rose to a height of 20-feet. In one corner the wood treatment plant abuts into the school yard. The foundry has its premises running the whole length of the fourth side, separated only from this 20-ft. wall by a narrow passage a few feet wide. This playground therefore forms a well surrounded by high walls on four sides. This is the playground used by all the girls. The other playground is only used to enter and leave the school buildings.

In the middle of the last century, Shakespeare Mill, as it was then called, was a cotton spinning mill. Its owners then developed the foundry next door to manufacture the internationally famous Blackburn Loom. Both works shared a pair of lodges in the foundry yard. In the 1890s Shakespeare Mill was burnt down. The spinning mill extended across the West playground, the lower three storeys of its eastern end being the present classroom block. A weaving firm rebuilt the mill and built a weaving shed on the site of the east playground. The vertical beam engine occupied a large space, now totally sealed off in the present classroom block.

Due to expansion of the India trade a second weaving shed was built on the site of the western playground. The engine could not obtain enough water through the existing flow and return pipes from the lodges to supply the extra steam required. Larger diameter pipes had to be laid. Because the looms were already in position they had to leave the old pipes behind

and lay the new pipes along the aisle between the looms. Thus there are two pairs of pipes connecting the site of the classroom block with the foundry yard. At any point in their length flaws could have developed in these disused pipes.

By dye and smoke tests it was discovered that there was a direct connection between the point of seepage A, the manhole B, the Drain D, and the waiting room F. Smoke pumped for two hours up drain D appeared in small quantities under the waiting room floor F. The connection between drain D and the waiting room floor F would appear to be by a flaw in one of the four large diameter pipes E running from the site of the lodges to the engine house in the classroom block. The previous owner of the mill recollects that in the 1930s, when steam was released under pressure, instead of a reduced pressure as instructed, steam appeared unaccountably from under the waiting room floor, which was then an office. This happened frequently, causing clothing hung there to be saturated. The defect was not rectified. A link between this underfloor area and the engine house, boiler house and main sewer would appear to have existed due to a broken drain.

A known temperature inversion at the time of the outbreak would favour the fumes from the wood treatment plant settling on the floor of the West playground. This situation would be enhanced by the playground being in a well, totally surrounded by high walls. Smoke from the wood treatment plant has been seen to fill the playground area under suitable conditions. It would be reasonable to suppose that either source of aromatic hydrocarbons or both together could have contaminated the school.

To summarise, one has a situation where aromatic hydrocarbon loss has been proved from two sources, both could reasonably have contaminated the school, and many of the girls exhibited signs and symptoms typical of aromatic hydrocarbon poisoning.

The timing of the outbreak coincided with a change in the routine of the phosphating process. Innumerable variables in routine were possible in the uncontrolled burning of the wood shavings during a year in which experimentation with different methods had been carried out in the wood treatment plant. Withdrawal symptoms are known to occur with aromatic hydrocarbon poisoning, and there must be some variation in individual susceptibility.

The sketch plan shows the spacial relationships, and pupils and teachers have occasionally remarked on unidentified unpleasant smells within the school at the places indicated.

In investigating possible toxic hazards in the sub-stage area, precautions were taken to avoid poisoning. When the contents of the sub-stage area were being examined the air was very foul and laden with mould dust. Dr. Grime collected samples using breathing apparatus connected to an external pump. At one stage, air inadvertently came into the mask around its edge causing a stinging sensation in the eye. Two firemen wearing self-contained respirators without their own oxygen supply suffered some respiratory embarrassment whilst undergoing physical exertion in moving chairs in the sub-stage area.

TOXICOLOGY OF AROMATIC HYDROCARBONS.

A study of the toxicology and biochemistry of the aromatic hydrocarbons shows that with the two exceptions of benzene and toluene there are no established biochemical tests to determine if exposure has occurred, or to ascertain if sub-clinical or incipient injury exists as a result of contact with these hydrocarbons. Apart from repeating the exposure conditions, which is unjustifiable, one is unable to prove an exposure effect. There is no enzymatic or biochemical test for aromatic hydrocarbons as for example in the case of, say, alkylphosphate poisoning, when the detection of a biochemical lesion can be made by measuring the blood cholinesterase concentration. (Gerarde 1960). It will be noted, therefore, that the fact that six cases amongst the St. Hilda's girls had a blood cholinesterase reading within normal limits does not preclude the presence of an aromatic hydrocarbon neurotoxin.

It is useful at this stage to consider in more detail the toxicology of two members of the aromatic hydrocarbon group, both of which were ones which might have contaminated the school. These two, benzene and benzine, the latter being a mixture, are amongst the commonest used in industry. Either, in theory, could have produced a chronic intoxication or an acute or chronic intoxication. The details of these two aromatic hydrocarbons given below have been summarised from the standard work "The Toxicology of Industrial Organic Solvents" by Ethel Browning, published for the Medical Research Council. (Browning 1953).

Benzene (or Benzol)

Benzene, or benzol, is an aromatic hydrocarbon derived from coal tar. It is to be distinguished from benzine which is a hydrocarbon mixture of uncertain properties and varying constituents, chiefly hexane and heptane, which is a distillate of petroleum. Benzene has many uses. Included amongst them are the use as a solvent and as a constituent of paints, varnishes, stains for floors and woodwork and floor waxes. It is also used in paint and varnish removers.

Individual predisposition has been described as the most important factor in determining whether a given time and intensity of exposure to benzene will produce the symptoms of poisoning amongst a group of individuals. A predisposing factor is general lowering of the vitality.

Signs and symptoms of acute benzene poisoning

A great variation has been shown in individual susceptibility. It is considered that muscular exertion tends to increase the susceptibility to poisoning. Emotional reaction has also been shown to be a factor in increasing the severity of intoxication. Dvoretzky (1914) described an account of "Massenvergiftung" by benzene in a Russian factory, where the medical authorities considered that of the 230 persons involved, the greater number were affected by hysteria only and that a few suffered from benzene poisoning together with hysteria.

In a mild form, euphoria occurs, followed by giddiness, headache, nausea, vomiting, staggering gait, and a sensation of tightness in the chest. In more severe cases convulsive movements are seen, as is paralysis, unconsciousness with dilated and non-reacting pupils. There is no blue-grey

colour of the face as is seen in nitrobenzene poisoning. Atypical forms are seen, preceded by either coma or a state of violent excitement and delirium ('as if gone crazy' as stated by one observer), followed by unconsciousness. The after-effects of acute benzene poisoning are often of a temporary nature and include pain in the head and chest, shortness of breath, giddiness, loss of appetite, sometimes nausea and even vomiting, and nervous exhaustion.

Signs and symptoms of chronic benzene poisoning

Young women are generally regarded as being especially liable to chronic benzene intoxication.

The signs and symptoms are of headache, drowsiness, lassitude, loss of appetite, nausea, and even vomiting. Possibly pallor may be present and an anaemic condition, metrohagia or menorrhagia may occur. Ecchymoses and haemorrhage may be present. Oppression is felt in the chest. Characteristically the patient appears pale, dyspnoeic and anxious with a rapid pulse and often a raised temperature.

Benzene has a neurotoxic action producing neurological signs and symptoms. Increased tendon reflexes have been demonstrated as has bilateral clonus, a positive Babinski reflex, impairment of deep sensation, pseudo-tabetic lesions with parasthesia, atoxia and paraplegia and motor impairment, signs indicating lesions of the posterior columns and pyramidal tracts. A localised myelitis has been observed with the presence of spastic paresis, nystagmus and a positive Babinski reflex. Frequency of micturition has been reported as a common symptom. Evidence of the neurotoxic effect of Benzene is given by Smith (1928) in the table which follows. Where similar symptoms were experienced by girls from St. Hilda's School, these have been given for comparison.

TABLE 1.

Frequency of symptoms of
BENZENE POISONING AMONGST WOMEN
(Smith 1928)

The frequency of occurrence of the same symptoms is given, where applicable for the girls involved in the St. Hilda's School Outbreak.

<i>Complaint</i>	<i>Smith</i> <i>No.</i>	<i>Data</i> <i>%</i>	<i>St. Hilda's</i> <i>No.</i>	<i>Data</i> <i>%</i>
Headache	18	.. 60.0	.. 91	.. 77.1
Excessive fatigue	14	.. 46.7	—	—
Dizziness	13	.. 43.3	.. 98	.. 83.1
Nausea	10	.. 33.3	.. 68	.. 57.6
Anorexia.....	9	.. 30.0	—	—
Weakness	8	.. 26.7	.. 62	.. 52.5
Nervousness	6	.. 20.0	.. 39	.. 33.1
Numbness and tingling..	5	.. 16.6	.. 48	.. 40.7
Frequent urination	4	.. 13.3	—	—
Nose bleeding	4	.. 13.3	—	—
Disturbed sleep	4	.. 13.3	—	—
Indigestion.....	4	.. 13.3	—	—
Frequent menstruation..	3	.. 10.0	—	—
Shortness of breath	2	.. 6.7	—	—
Skin eruptions	2	.. 6.7	—	—
Vomiting	2	.. 6.7	Less than 10	8.5
Pain in abdomen	2	.. 6.7	.. 67	.. 56.8 (inc. back)

Severe cases of chronic benzene poisoning show the characteristic blood picture of leucopenia with neutropenia, thrombocytopenia and some anaemia. It is interesting to note that there is a "lag phenomenon" in benzene poisoning. Symptoms can appear long after exposure has ceased and in cases where no signs of intoxication were present during the period of exposure. Usually the appearance of symptoms has coincided with some infectious disease. It is considered, in such cases, that when an infection makes an extra demand on the haemopoietic system, the damage caused to the system by a previous exposure to benzene intoxication is made apparent.

Benzine

Benzine includes a group of substances covering a wide range of chemical composition and properties. These differences in composition no doubt cause the somewhat discrepant effects of benzine that have been described. The composition of benzine depends to some extent on the petroleum from which it is distilled. This in turn varies with the country of origin.

Commercial benzine, which is used as a solvent, and as a constituent of parasiticidal sprays as well as a motor fuel, has properties which vary. This is especially so according to whether it contains benzol, xylol, and toluol (as in American and German benzine) or naphthenes and paraffin hydrocarbons (as in Russian benzine). In the former case the presence of benzene and its homologues, chiefly xylene and toluene, may amount to as much as

20%. The vapour of benzine is three times heavier than air.

Signs and symptoms of non-fatal acute benzine poisoning

Intoxication with psychic disturbances was a conspicuous feature in many cases described. A return to consciousness has been accompanied by hysterical laughter and muscle twitching. Other observers have described such symptoms as paralysis of the legs, bladder and rectum, cyanosis, disturbances of respiration and heart action, headaches, dizziness, nausea, abdominal pain, blurred vision, tingling of the limbs, and drowsiness. In some cases there is often euphoria accompanied by a slight disturbance of sight and hearing.

Signs and symptoms of chronic benzine poisoning

Symptoms here chiefly relate to the nervous system, a special feature observed being the occurrence of functional neuroses. Signs and symptoms include disturbances of general health, giddiness, black spots before the eyes, insomnia, headaches, somnolence, asthma, gastro-intestinal disturbances (loss of appetite, eructations, burning sensation in the stomach, sometimes vomiting) and weakness. An increased incidence of bronchitis, respiratory catarrh, and conjunctival and skin lesions has been reported.

Nervous disturbances

Both psychic and motor and sensory changes have been reported. The latter appears to be regarded by most authors as hysterical or functional in origin rather than organic. Hysterical anaesthesia was observed by Werbow, Aschkewica and Stopjanowskaja (1925) and hysterical and neuro-psychic disturbances in golosh-workers were recorded by Rawkin and Kulkow (quoted by Schachnowskaja 1935). Frumina and Fainstein (1934) investigated 88 men in a factory making rubber water-proofs. They found that the incidence of functional neuroses was higher in those parts of the factory where the concentrations of benzine vapour were highest (45.4% in the higher and 34.1% in the lower). Experimental results obtained by Schachnowskaja (1935) on the increased permeability of the cerebrospinal membrane in animals exposed to benzine led her to conclude that this phenomenon was to be correlated with the nervous symptoms produced. Motor and sensory changes were prominent in some cases of chronic benzine poisoning recorded. One observer's cases exhibited heaviness in the limbs with pain and actual loss of motor power in the hand, arm and leg, with tremors of the tongue, hand and eyelids, nystagmus, sensations of cold, and paraesthesia in the hand and arm, and increased knee jerks.

Acquired tolerance has been described in animals subjected to repeated inhalation of benzine. Other animal experiments have demonstrated a conditioned reflex after repeated slight attacks of benzine poisoning. Nervous symptoms, such as convulsions and rigidity, occurred when the animals were introduced into the inhalation chamber without further actual exposure to benzine.

Injections—The puncture bites of insects are capable of introducing infective agents like viruses but no epidemic of such bites occurred. This matter was looked into particularly closely as some suggestion of swarms of black flies was made as a possible cause. The teachers were adamant that

there was never at any time swarming within the school precincts of any biting insects of any sort although there may have been some black flies on the nearby demolition site. Fleas at this time were no more evident than expected and the vast majority of girls at the school had no experience of them.

Hypodermic injection of numbers of pupils in such a limited period of time is not a practical supposition and most girls, as with drug exhibition, are too sensible to accept this method of stimulation.

The possibility that toxic agents might be inserted through skin abrasions by newly-worn clothing and uniforms impregnated to produce non-flammable safety garments was discounted by the fact that most of the girls were wearing clothing worn previous to the outbreak and the use of borax/boracic acid compounds used for such purposes, whilst it can irritate sensitive skins is not particularly toxic.

Invasion—In view of the so recent Poliomyelitis outbreak and the very intensive use of Sabin vaccine it was necessary immediately to exclude the possibility that the latter might be involved in the St. Hilda's incident. The record of every girl affected in the school was cross-checked to ascertain the vaccination history. The girls at the school come from the County as well as the County Borough and of the girls from the Borough none were vaccinated at the school. They had vaccine at various parts of the town, at varying times. They received vaccine from more than one firm and the batch numbers varied from girl to girl. Other persons of the same age group at other schools who had similar batches of vaccine had no such illness and it must be remembered that about 15,000 school children shared the experience of being vaccinated but none shared the experience of the St. Hilda's school. The second vaccine does had for the most part been given between 2 and 3 weeks previously.

The possibility of another type of neurotropic virus having caused the outbreak by inducing a mild encephalitis was a theory with many drawbacks. It is difficult to envisage a virus so sophisticated at its first emergence as to be specific for limited areas of nervous tissue in the mid-brain or 4th and 5th segments of the spinal cord necessary to produce the syndrome at St. Hilda's. To be so limited by existing individual immunity as to be confined to the Junior members of a closed community and to strike down the susceptibles within hours without spreading over a time interval. To appear without manifestations of herald cases and to leave the affected persons for the most part restored to reasonable vigour within a week.

At this stage, it is convenient to study the hospital investigations.

Dr. P. D. Moss, Consultant Paediatrician to the Blackburn and District Hospital Group, examined all the cases admitted to Park Lee Hospital. His findings are summarised below.

He found the striking features were swooning, moaning, chattering of teeth, hyperpnoea and tetany. No drugs were administered and the tetany was controlled by rebreathing into a plastic bag under supervision. Thirty-four girls remained in the ward overnight. Six girls required re-admission over the weekend and three new cases were taken in over this period. By Sunday, 10th October, there were still 20 cases on the wards. They were detained because they were still fainting, overbreathing and having attacks of tetany. Some had been discharged only to be re-admitted. Fifty-four

cases were admitted on Monday, 11th October. The proportion detained in hospital was slightly higher on this date (53.7%) than on Thursday, 7th October, when 40% were detained. The greater severity of symptoms was limited to those cases involved for the second time ; of the 30 new cases, only eleven were detained (36.7%) on 11th October.

The last original case was discharged on Saturday 17th October. One girl was re-admitted on the 18th and discharged on October 20th.

Symptoms

The prominent symptoms and their frequency is given below. The very high incidence of tetany is to be noted.

TABLE 2.
INCIDENCE OF MAIN SYMPTOMS

Dizziness	..	..	..	..	..	98
Fainting	..	..	..	..	..	91
Headache	..	..	..	..	..	91
Shivering	..	..	..	..	..	78
Felt cold	..	..	..	..	..	72
Pins and needles	..	..	..	..	..	69
Nausea	..	..	..	..	..	68
Pain in back or abdomen	..	..	..	..	..	67
Felt hot	..	..	..	..	..	66
Hyperventilation	..	..	..	..	..	62
General weakness	..	..	..	..	..	62
Teeth chattering	..	..	..	..	..	55
Tetany	..	..	..	..	..	52
Upper limb only	..	..	..	15		
Lower limb only	..	..	..	5		
Upper and lower and face	..	..	..	10		
Upper and lower	..	..	..	22		
Numbness of face	..	..	..	..	..	48
Feeling of panic	..	..	..	..	..	39
Pain in chest or neck	..	..	..	..	..	27
Difficulty in speaking	..	..	..	..	..	14
Vomiting	..	..	..	..	..	less than 10
Enuresis and other bladder dysfunction	..	..	..	..	odd cases	

Physical Signs

A low grade fever was present in a very few cases. Overt Hyperpnoea occurred in 62 cases and tetany in 52 cases. Hysterical type anaesthesia was found in some cases. A rather puzzling finding was other areas of altered sensation in other cases. These appeared to be related to genuine nerve distribution and therefore were suspected of being of organic origin. These were usually symmetrical, one or more of the following being defined by an area approximately two inches in diameter over the deltoid muscle, areas in the antero-lateral aspect of the forearm, over the thenar eminence, some

finger tips, antero-lateral aspects of thigh and lower leg, and the dorsum of the foot. The combination of these features led to the suspicion of central nervous disease in some cases. In the circumstances it could be possible that the hyperventilation might be of central origin.

On Monday, 11th October, a neurologist examined some of the more severe cases but the diagnosis remained uncertain. It is possible that these areas had been affected as a result of hyperventilation and that it was a neuro-vascular effect, which is well-recognised to occur in that condition. The prolonged neurovascular effect exhibited might have been due to the repeated episodes of hyperventilation.

Laboratory investigations

Twenty-nine throat swabs were tested for viruses but no growth was obtained in Hela or monkey kidney cells. Faeces were collected from a similar number of cases. Of those cultured, one proved positive for Coxs-achie B3. This girl had a mild sore throat and a low grade fever. This virus had been isolated from other cases in the Blackburn area. The first specimen of what had been hoped would be paired sera were collected but it was not practicable to collect the second sample and that investigation is not therefore complete. A lumbar puncture was performed in nine cases. No increase in cells or globulin was found. The highest C.S.F. protein value obtained was 50mgm%. The nine samples of cerebro-spinal fluid were inoculated into Hela and monkey kidney cells but no virus growth was obtained. Six samples of blood were examined for cholinesterase content to see whether the presence of a neurotoxic agent was indicated. The cholinesterase content was found to be within normal limits in each specimen. A few throat swabs were examined for bacterial pathogens and a few blood counts and blood sedimentation rates estimated, but negative results were obtained.

On the 16th October, 1965, the British Medical Journal published in the Epidemiology section, the following summary of information supplied to them by Dr. Moss.

"MYSTERIOUS ILLNESS AT GIRLS' SCHOOL"

An illness affecting about 80 girls at St. Hilda's School, Blackburn, Lancashire, is thought to be an unusual type of encephalitis. Up to 12th October the disease had been restricted to girls aged 11 to 15 with the exception of one case, a middle-aged woman teacher.

The onset is sudden, often with fainting, violent shivering, hot and cold feelings, and hyperventilation. Tingling in the face, hands, and legs follows, and tetany may develop. Within a few minutes or up to half an hour or so the symptoms pass off, but the child may experience further attacks over the next few days. The temperature may be slightly raised and some of the children seemed mentally dulled. Other features of the illness noted in some cases are pain in the abdomen, which may extend to the back and shoulders, paraesthesiae in the limbs, and areas of altered sensation—notably behind the shoulders, on the thenar eminence, at the tips of the fingers

and in front of the forearms, thighs and shins. Nothing of significance has so far been found in the cerebro-spinal fluid or blood. The disease appears not to be connected with food, sweets, toxic sprays, or poliomyelitis. (We are indebted for this information to Dr. P. D. Moss, consultant paediatrician to Blackburn and District Hospital Group.)

Dr. Moss, however, concluded that the hospital investigations did not point to the presence of an organic illness, and that he was of the opinion that the outbreak was hysterical in origin in view of the findings of the psychological survey described later.

Reverting to the discussion of possible causes, as per the schedule, we have the possibility of intent or the possibility of individual neurosis.

Intent—

(1) A rather dangerous game played by pre-adolescents in many parts of the country is the trick of over-ventilation by overbreathing to the point of producing pins and needles and then blowing out forcibly against a closed glottis and momentarily losing consciousness. This game was known to have been tried in St. Hilda's at least a year ago but no evidence of recent application was forthcoming. The practice is not one to be encouraged and can carry risk of collapse.

(2) Although it is difficult to prove intent to exploit the situation it was suspected that some girls were deliberately simulating the symptoms of their fellows for gain even to the point of contriving admission to Park Lee Hospital and this was confirmed by independent assessment of Local Authority and hospital staffs.

Individual Neurosis—

Of all theories of causation this is possibly the most fraught with anomalies and most likely to arouse antagonisms. The need to rule out all possible 'organic' causation for illness before postulating a 'functional' one is ingrained in medical teaching and not without reason. I am not disposed to accept that individual neurosis can flow over into group neurosis of the hysterical type in such a lively community without previous conditioning.

The conditioning must surely be of two types—

- (1) To prepare the group for some measure of common identity so that they are ready to move with the herd.
- (2) To prepare the unified manifestation of symptoms to which the members will gravitate when stress occurs.

It is possible that St. Hilda's reached this level of conditioning because
 (a) they had just emerged from a severe worrying stress due to the publicity about Poliomyelitis and due to the undoubtedly weakening influence of oral vaccine on susceptibles,

(b) they had experienced standing for about 3 hours in a hot, humid atmosphere without supportive beverages of any sort,

(c) they had seen many of the group collapsing about them and then the most fatigued pupils removed to the Infirmary were subjected to the very heavy stress of being involved in the undisciplined behaviour of a young girl under the influence of alcohol, seeking to abort,

(d) the same group had been exposed intermittently to toxic hazards at school of a nature to stimulate the symptoms which emerged,

(e) the group were finally subjected to the experience of again seeing their fellows go through the not too pleasant collapsing spasmodic and shocking manifestations on the Thursday after Princess Margaret's visit.

THE PSYCHOLOGICAL SURVEY

To elucidate the possibility of an hysterical reaction, Dr. C. P. McEvedy of the Department of Psychological Medicine of the Middlesex Hospital, University of London, was consulted.

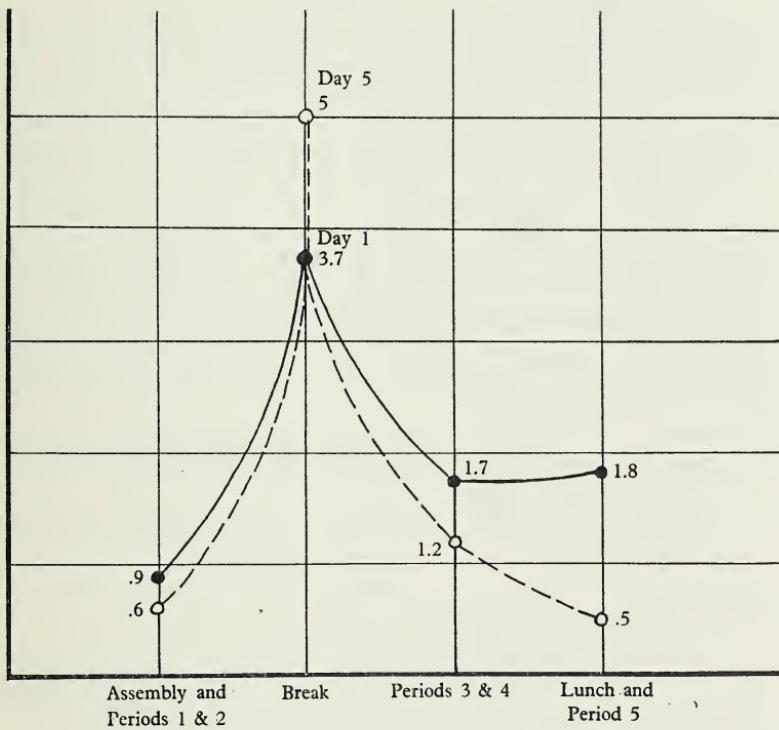
The problem was approached by first of all assembling a series of statements which would only be true if the epidemic were hysterical and then information was obtained to test them decisively. By hysteria is meant, in this report, neither the layman's concept of a conscious outburst of abnormal behaviour nor the psychiatrist's concept of hysteria as a sign of mental disease, but an unconscious exhibition of histrionic signs and symptoms, a tendency to exhibit them being presumed to be present along a normal curve of distribution in a healthy population. When a normal population is exposed to sufficient stress, those with hysterical traits in their personality will demonstrate hysteria. The importance of this concept of hysteria is that one can only hope to discover statistical differences between the affected and unaffected persons in an outbreak of mass hysteria. The affected cases are not pathological and will not show features that distinguish them absolutely. The distribution curve is one of constitution and hysterical behaviour has to be elicited in the normal bypassstress. If a girl's classmates are affected, she may respond because the stress on her is high whereas a girl of identical constitution in an unaffected class will remain uninvolved.

There are two facts concerning hysterical constitution and one hypothesis. The facts are that the hysterical reactivity of the female is higher than that of the male and that from adolescence onwards the reactivity declines. The hypothesis is that propounded by Professor Eysenck who has defined two axes of personality, E and N, and predicted that the more hysterical will be found in the high E/high N quadrant of his diagram. (E stands for extroversion, N for neuroticism ; scores on both axes are obtained from responses to standardised questionnaires). Two questionnaires were specially printed for this investigation (see appendix) and were given to the girls at St. Hilda's school together with The Eysenck Personality Inventory (Form A).

There were 589 girls on the school roll. The questionnaire was filled in by 552 girls, of whom 17 were absent on both Thursday, 7th October and Monday, 11th October, when the major number of cases occurred. The experimental population is, therefore, 535. According to the questionnaire, which of course was retrospective, 519 girls were present on Thursday, 7th October, and 141 claimed they were ill. On Monday, 11th October, 476 were present and 79 claimed they were affected. The number who some weeks later said they were affected on the respective days is in excess of those who complained of being ill at the time. There is thus a discrepancy

NEW CASES PER 5 MINUTES

FIGURE 5.



in the ratio of affected to unaffected cases recorded during the outbreak and the ratio expressed retrospectively by the girls own evidence on the questionnaire. The ratio of affected to unaffected girls applied in the report is the one recorded at the school and hospital at the time of the outbreak except in discussing the psychological survey when the ratio recorded on the questionnaire is applied.

Four predictions were thus made and they were tested against the evidence as follows :

- (1) *Hysterical reactivity, being to a considerable extent constitutionally determined, the same population should be affected on each occasion.*

The outbreak can be considered to have started at the Cathedral on Wednesday, 6th October on day 0, continued the following day, day 1, with a recrudescence in the school on the Monday, the 11th October, day 5, and so on. All of the 25 girls who fainted on day 0 and went to school on day 1 were affected in the day 1 episode. None of the nine girls who were absent on day 0 and present on day 1 were affected. It is suggested on the learning theory that failure to go to the Cathedral had a protective effect as far as the later stages of the epidemic were concerned. Of the 95 girls who were both affected on day 1 and present at school on day 5, 51 were affected in the second much-smaller episode when there were 79 cases as against 141 on day 1. Of the 58 girls who claimed they felt ill when the school re-opened on day 19, 52 had been affected on days 1 or 5. The retrospective evidence provided in this last statement by the girls is of questionable validity as on this day, when a Medical Officer was present at the school, no girl reported feeling ill.

- (2) *The contagion in an hysterical epidemic being behavioural, the epidemic should disseminate more rapidly when the social group is unified than when it is sub-divided.*

This means that the number of new cases should be higher in the break periods than at lesson time. Similarly, the majority of cases should occur in public places, such as the assembly hall, playground and corridors as against the classrooms.

The initial impression was that neither proposition was true and that every time and place had yielded its quota of cases. However, though it was correct that sporadic cases occurred throughout the morning and throughout the school buildings, the theoretical expectation received ample support when the questionnaires were analysed. Fig 5 shows that on both days 1 and 5 the number of cases was higher during break than at any other time by a factor of 2 or more and, although the ratio of time spent in public places to time spent in classrooms was 4 : 7, the ratio of cases occurring in these times was more than reversed on day 1 at 85 : 34. On day 5 it was 31 : 32 ; still shifted in the predicted direction but less convincingly so.

- (3) *The younger being more susceptible, the incidence of new cases can be expected to move to the lower end of the school as the epidemic progresses*

(provided that it does not actually begin at the lower end, in which case one can only say that it should continue heaviest there). This was the prediction on which most weight was placed and the concept is worth

quantifying in a simple way. If we take an epidemic starting in the middle of the school and consider just the initiating class, we would expect the disturbances to propagate roughly geometrically within this rank because the stress on its members is proportional to the number affected at any time. In the model in Fig. 6a, each successive figure in the central, initiating rank is the sum of those below (preceding it in time). In the senior classes to the left of the initiating rank, the epidemic will propagate similarly but after a time lag. For the junior and more susceptible classes their increased reactivity requires the use of a multiplier—say 2 and 4 respectively for the lower and lowest. In the lowest class each figure thus represents four times the sum of the antecedent cases.

This model suggests a definite path for an hysterical epidemic—a swing towards the younger end with time. It is gratifying to find that on day 1 this path was followed exactly and convincingly. (Fig. 6b : the number of cases in the sixth and fifth forms needs multiplying by 6 because of the small size of these classes). On day 5 (Fig. 6c) the pattern is the same but the epidemic peters out in the last phase. The swing to the right with time is clear enough, however.

(4) On the Eysenck hypothesis *the reacting girls should score higher in E and N*. As will be seen from Fig. 7, they did so consistently. The narrowing of the gap between the affected and unaffected E scores towards the younger end is not surprising as it has been shown that on the junior version of the questionnaire the standard deviation of the E scores declines by a full point as the age drops from 16 to 10. The various age effects and the uneven incidence of the epidemic can be nullified if the E and N scores for each girl are summed and each form then ranged in descending order. Fig. 8 shows that when this is done the result is a slope showing a simple relationship between form rank in E+N and involvement in the epidemic : nearly 40% of the girls occupying the higher score places were affected, as against under a quarter in the mean position and under a fifth of those at the lower end of the ranking.

Understandably, the E+N score functions best as a predictor in forms where only a few girls are affected ; the less girls are affected the higher their mean position in the E+N ranking (Fig. 9).

Taking hospitalisation as an index of severity, the E+N scores show no tendency to rise above the mean for the affected group as a whole with increasing severity of symptoms. The major factor relating to admission was age ; of 115 cases in the upper part of the school 44 (38.3%) were admitted, as against 22 (19.5%) out of 113 in the lower part. There was also the effect of re-referral ; as already mentioned, involvement on both days was associated with a far higher chance of admission on the second.

Age also governed length of stay in hospital ; the class I average for admitted cases was 2 days, for class II the figure was 3 days, for class III 3.2, and for classes IV, V and VI taken together 3.8 days. The age of the class is obtained by adding ten to the class number *i.e.*, class IV is composed of 14 year olds.

These findings are consistent with hysterical reactivity having a time constant that is proportional to age ; the younger will excite faster but the

disturbance will equally rapidly decay. The more severe second reaction is to be expected from learning theory. There is a lie scale built into the E.P.I. and in accordance with Eysenck's recommendation all E.P.I.s in which the lie score was 6 or more were discarded.

(5) Although the normality of the population involved has been stressed, there will inevitably be a few individuals in a community this size who have shown evidence of behavioural morbidity ; it was predicted that *any girl attending a Child Guidance Clinic would be involved for sure*. There were three such girls in the school ; all three were detained in hospital and despite the fact that one was absent from school on day 1, the three piled up a score of 6 admissions between them.

Dr. McEvedy states that the psychological survey thus showed :

1. The same population tended to be affected on each occasion.
2. The cases occurred more rapidly when the girls were together than when they were separated into smaller groups.
3. The outbreak began amongst the 14 year olds but the heaviest incidence moved to the youngest age group with time.
4. Using Eysenck Personality Inventory it was established that the mean E and N scores of the affected were higher than those of the unaffected in all age groups.
5. The younger proved more susceptible but disturbance was more severe and more long lasting in the older age group.

Dr. McEvedy suggested that these five facts are in favour of the outbreak being one of hysteria.

RECOMMENDATIONS.

1—The elimination of suspect hazards, namely, the emission of fume into the school by the central heating unit, the production of toxic materials in such close proximity to the school in an uncontrolled manner by the adjacent industries mentioned.

2—The removal of all chairs, fabrics, etc. from the sub-stage area and their destruction by incineration. The intensive fumigation of the sub-stage space followed by adequate cleaning, ventilation and abandonment of its use for storing junk.

3—Insistence by the Corporation on the complete sealing of *all* drains to the satisfaction of the Health Department staff on demolition sites. This has not been contrived on a number of sites and although it was not relevant to the St. Hilda's outbreak rat droppings were found under the floor of one

room and a dead rat was found within the school gate. Rat infestation was considered to be from the adjacent demolition site.

4—Complete fumigation followed by cleaning of the whole school.

5—Destruction of items of food exposed to the fumigant as per the following list :

School Kitchen

Three large, and one small containers of dripping
 Pastry from twenty-four trays
 Approximately 25-lbs. of Mince Meat
 Four containers of grated cheese
 One bag, and a partly used bag of carrots

Domestic Science Class

Five large, and five small containers of flour
 Two storage bins of flour
 Two open packets of castor sugar
 One open 7-lb. jar of Raspberry Jam (less than quarter full)

6—The pesticide “Warfarin” used in the school should be used only under the direction of the school caretakers and not indiscriminately by the domestic staff and particular care should be taken when using this preparation in either the domestic science classroom or the kitchen.

7—Several barrow loads of debris were removed from the drains accepting surface water from the yard channels and were obviously obstructing flow. This system should be cleared regularly.

8—The placing of an airtight seal over the area to be occupied by the new canteen now occupied by the waiting room, adjacent to the Headmistress's study.

9—The sealing off of any old pipes and conduits connecting the school with the foundry yard.

Discussions have been held with the proprietors of the two adjacent industries. The foundry have re-sited and improved the phosphating process. Alternative arrangements have been made to dispose of waste from the wood treatment plant. Two defective drain covers have been recified, one in the foundry yard and one in the east playground. Discussions have been held with the Architects and Builder responsible for the new school extensions to eliminate any structural defects that were found. The area under the stage has been treated for dry rot and two ventilators have been fitted to the doors of the understage area. All the recommendations made above have been effected or, in the case of structural alterations, are in the process of being implemented.

Since the toxic hazards have been removed there has been no re-occurrence of cases of collapse. It is interesting to note that the Headmistress reports that from the end of the outbreak in October, 1965, to the end of the summer term 1966, the absentee rate at the school has been consistently above the average for previous years.

Fig. 6A

↑
Time

				Multipliers	
				$\times 2$	$\times 4$
				12	18
3	6	12			
2	3	6	6		4
1	2	3	2		1
	1	2	1		
		1			

		Initiating			
Senior	Junior				
		School Classes			
1		15	10	13	26
3	2	15		2	5
3	3	3	3	2	
4		1	1	3	
3	2	0	0	1	
6th	5th	4th	3rd	2nd	1st
19	23	127	115	111	124

Figures represent
new cases in each
class in each time
period.

Fig. 6B Lunch and 1 1 15 10 13 26 Day 1
Period 5
Periods 3 & 4 3 2 15 2 5 Total 119
Break 3 3 3 3 2 +2 cases late p.m.
Periods 1 & 2 4 1 1 3 +20 cases no time
Assembly 3 2 0 1 stated.
GRAND TOTAL 141

		School Classes			
6th	5th	4th	3rd	2nd	1st
19	23	127	115	111	124
Number exposed Total 519					

Fig. 6c Lunch and 4 4 3 7 Day 2
Period 5
Periods 3 & 4 3 7 3 5 Total 63
Break 1 0 5 3 2 4 +3 cases late p.m.
Periods 1 & 2 1 3 2 1 2 +13 cases no time
Assembly 1 1 stated.
GRAND TOTAL 79.

		School Classes			
6th	5th	4th	3rd	2nd	1st
18	20	115	102	106	115
Number exposed Total 476					

FIGURE 7.

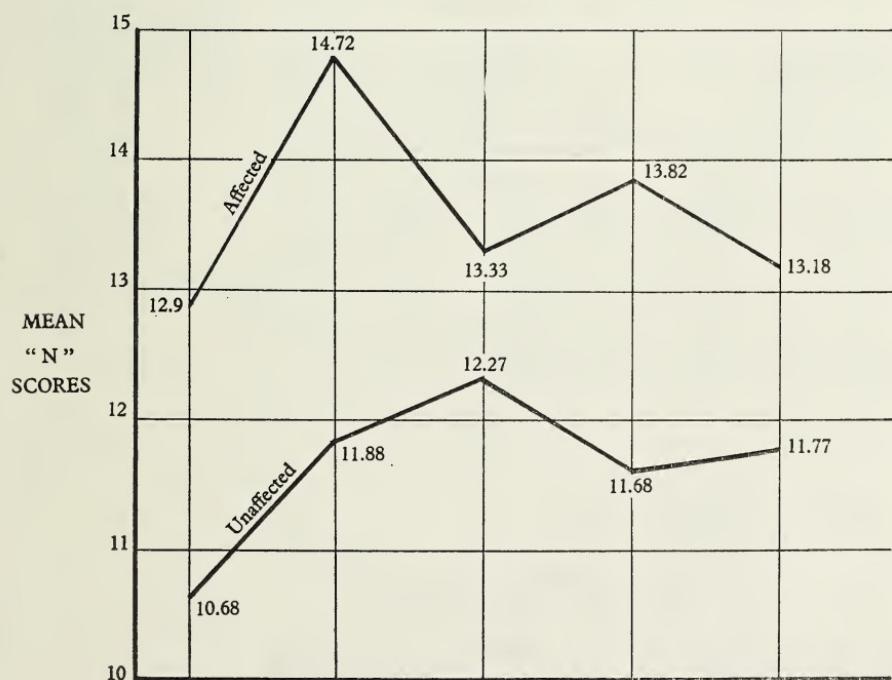
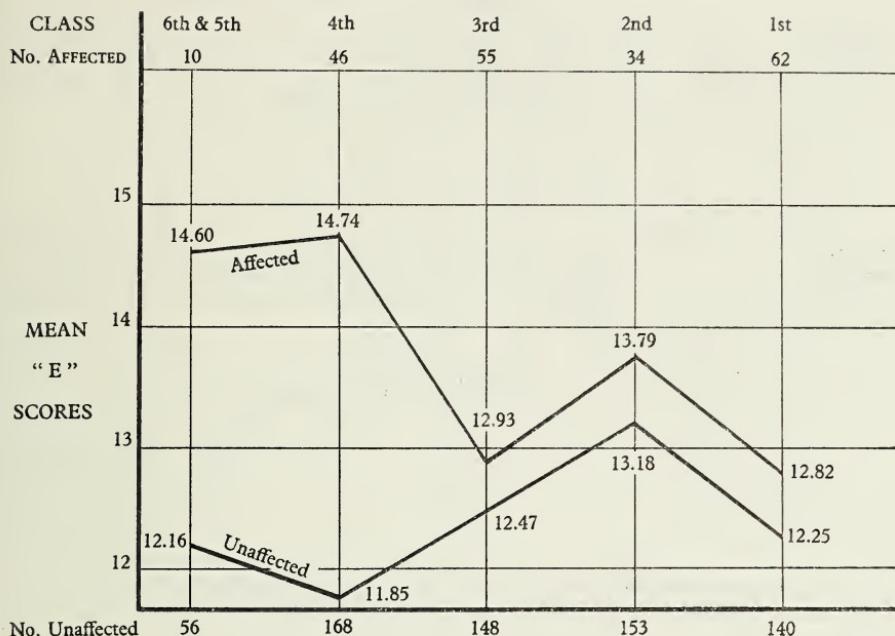


FIGURE 8.

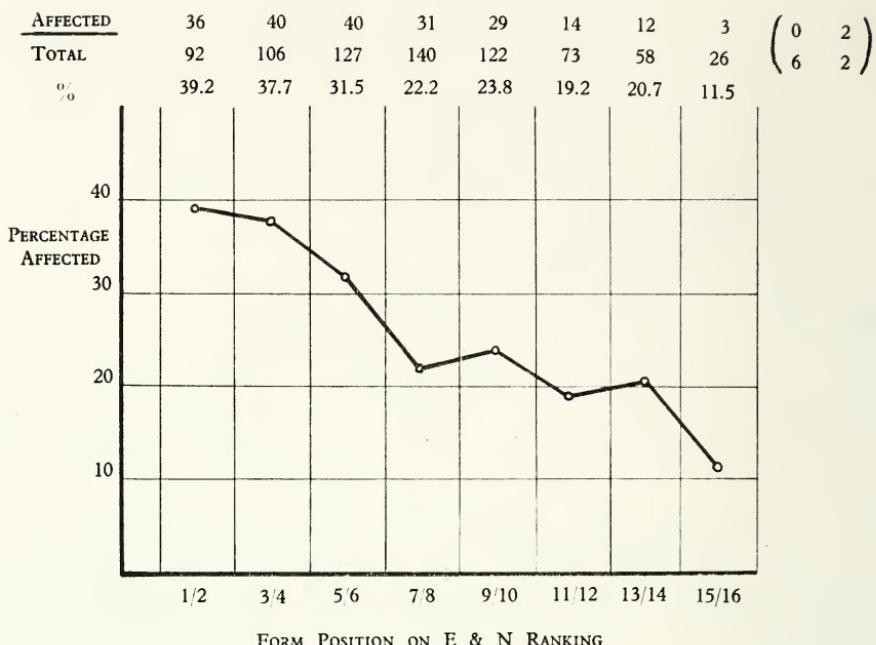
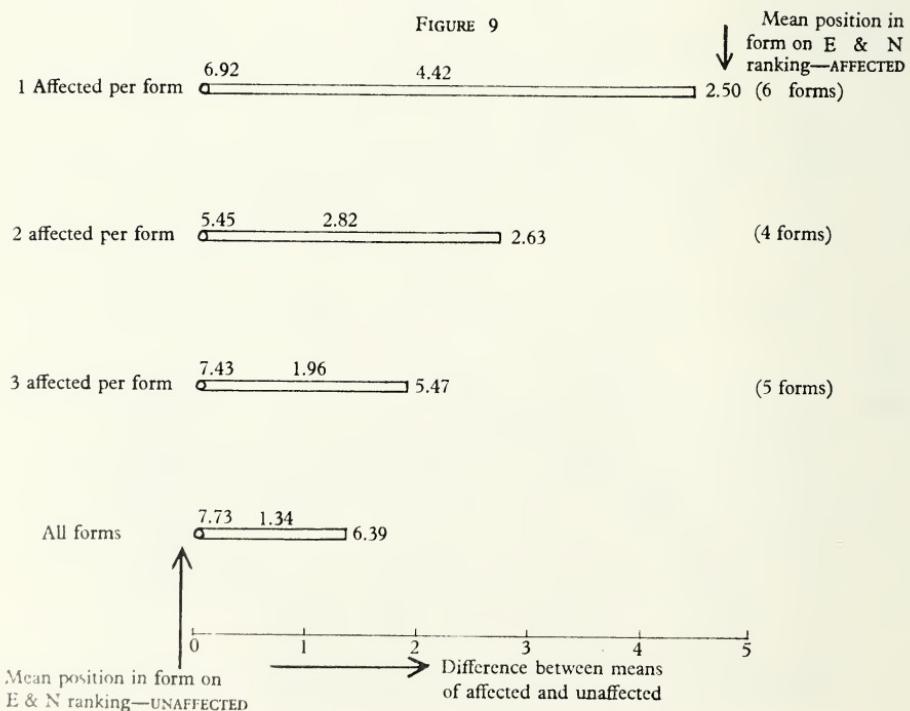


FIGURE 9



ST. MILDAS S.M. SCHOOL DRAINAGE PLAN & RELATIONSHIP
OF CONTIGUOUS BUILDINGS

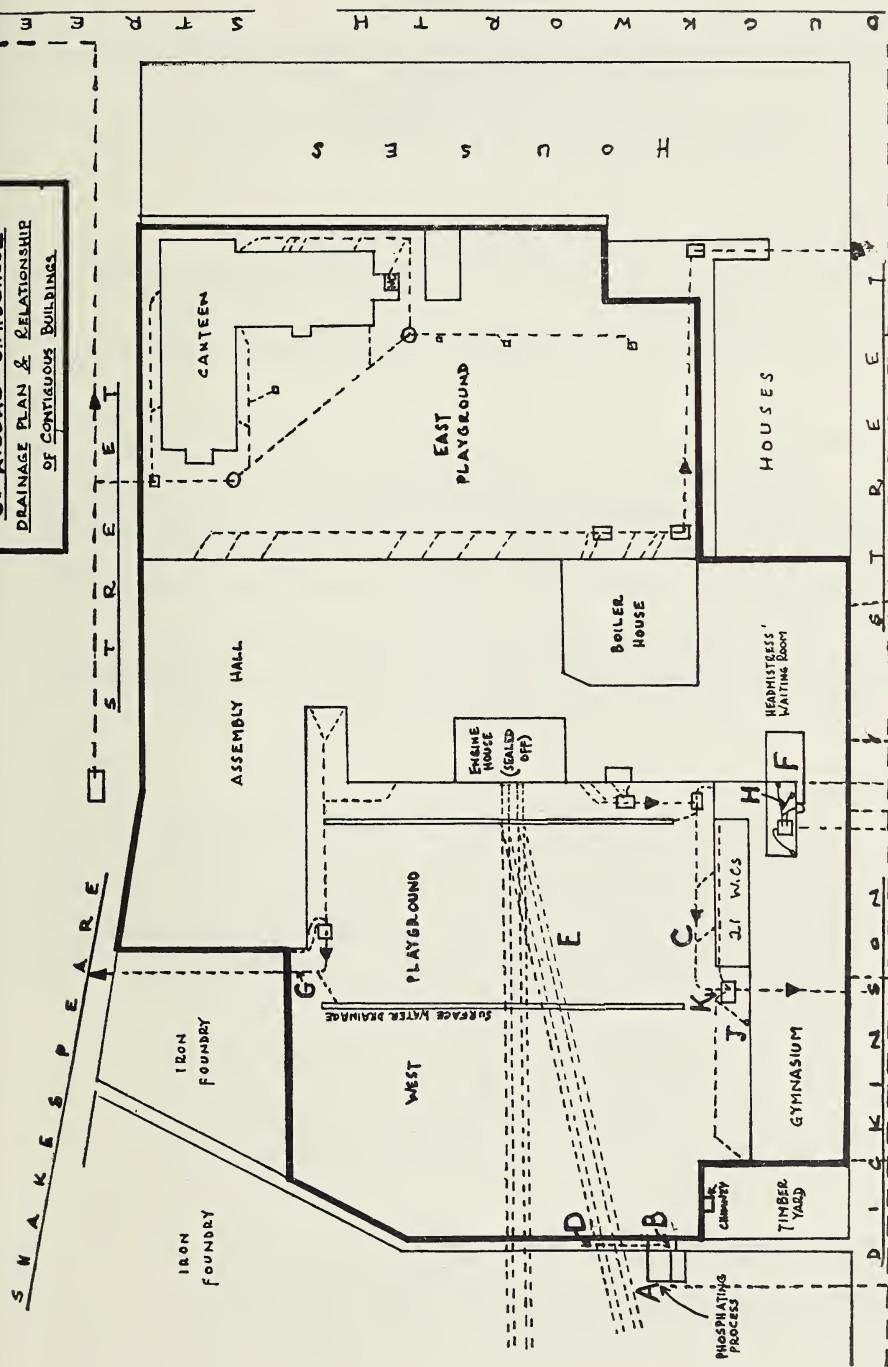


FIGURE 10

APPENDIX I.

REPORT ON THE SOURCES OF POLLUTION AT ST. HILDA'S SCHOOL, BLACKBURN

by S. HARGREAVES, Esq.,
Senior Lecturer in Chemistry, Blackburn Technical College.

Two sources of pollution have been investigated :

- (a) The emission of toxic fumes from the woodworking business adjacent to the school.
- (b) The degreasing and phosphating process at an adjacent Iron Works.

Source (a)

The shavings of wood are burnt in a slow burning stove. A proportion of the shavings are impregnated with wood preservative containing aromatic hydrocarbons. Such hydrocarbons can be volatilised without decomposition and are expelled from the short chimney. Witnesses testify that severe pollution does occur in the school playground due to the heavy emission from this source.

As a preventive measure it is recommended that the disposal of all waste on the premises should cease until further notice and consideration given to abating this nuisance as soon as possible.

Source (b)

The washings from the process enter drains which indirectly can be in communication with drains on the school premises. The degreasing fluid contains toxic hydrocarbons which, being volatile, can pollute the school drainage system. The firm concerned must be acquainted with this undesirable occurrence in order that they may resite their plant as soon as possible.

Preventive action to eliminate these two sources of pollution before opening the school is desirable.

APPENDIX II.

INTERIM MYCOLOGICAL REPORT ON SAMPLES RECEIVED FROM DR. GRIME,
Department of Public Health, Blackburn,

By Dr. C. J. LA TOUCHE,
Senior Lecturer in Medical Mycology, University of Leeds.

Samples received 10th October :

Green Cloth
Paper on gauze stuck to board
Chair

Direct Examination

Greencloth	Penicillium Aspergillus Cladosporium Mucor
Paper with gauze backing on board	Penicillium Cladosporium Mucor
Chair	Penicillium

Culture

Green Cloth	Mucor racemosus Aspergillus versicolor Penicillium spp.
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Samples received 14th October

1. Deposit from wall (plastered and painted)
2. Plaster and paint from wall surface
3. Plaster and paint from wall surface
4. Plaster and paint from wall in entrance hall
5. Mould on timber joist under floor of Assembly Hall
6. Mould from under Assembly Hall floor.
7. Mould from under stage floor. ? Dry rot
8. Fluorescent cloth under stage

Direct Examination

5. Mould on timber joist under hall. Some unidentifiable mould
7. Mould from under stage floor-Basidiomycete Mycelium—could belong to dry rot fungus. No obvious mould on other samples.

Culture

1. Deposit from wall plastered and painted :
 Cephalosporium sp. 1 colony
 Mucor sp. 2 colonies
2. Plaster and paint from wall surface :
 Penicillium sp. 1 colony
3. Plaster and paint from wall surface :
 Penicillium sp. 1 colony
4. Plaster and paint from wall in Entrance Hall :
 Penicillium sp. 1 colony
5. Mould on timber joist under hall :
 No growth
6. Mould from under Assembly Hall floor :
 Mucor sp.
 Penicillium
 Aspergillus sp.
7. Mould under stage :
 Bacteria and yeast
 Penicillium spp.
8. Fluorescent cloth under stage :
 Penicillium spp.

APPENDIX III.

**REPORT ON THE DRAINAGE SYSTEM AT
ST. HILDA'S C.E. SECONDARY MODERN SCHOOL,
Dickinson Street, Blackburn,**

by G. GREENWOOD, Esq.,
District Public Health Inspector.

(A) Flushing :

I visited the school on Tuesday, 12th October, 1965, with a member of the Blackburn Fire Service with a view to flushing through the whole of the drainage system.

Open Yard—Canteen (*See Plan*).

The drainage system associated with the Canteen was flushed. All pipes and appliances were checked. A partial blockage was found in one drain and two gullies. The defects were remedied and this system was then left completely satisfactory.

School :

The system in in the East Playground was flushed. Again all pipes and appliances were checked. No defects of any nature were found.

Large Enclosed Yard :

The drainage system as checked. The discharge point is not known but it is assumed that the drain runs under the adjoining Ironworks, and discharges into the main sewer in Shakespeare Street. This system included the yard drainage channels. These were found to be choked and were cleared by the Highway Department. There was also a complete blockage at point 'G' which was eventually cleared. All pipes and appliances were checked and left satisfactory.

A total blockage was also found at point 'C'. This was causing backing-up in both inspection chambers and would eventually have flooded the yard. This defect was remedied. All pipes and appliances were checked and left satisfactory. The outlet of this system runs under the floor of the gymnasium and discharges into the main sewer in Dickinson Street.

Small Enclosed Yard :

This drainage system was checked and found satisfactory. The outlet pipe runs under the floor of the changing rooms and showers and

discharges into the sewer in Dickinson Street.

The rainwater pipes on the Dickinson Street frontage were not flushed through. Equipment was not available to do this. However, all the pipes were sounded and no chokage was found.

(B) SMOKE TESTING :

Small Enclosed Yard :

The branch drain taking fittings H was tested. After a period of time a test was applied to the branch drain taking the water closet. The water closet seal was broken to ensure the drain was filled, and immediately sealed again. Smoke was then found under the waiting room floor. This smoke could be from three sources :—

1. A defect of the branch drain taking H.
2. The branch drain taking the water closet.
3. Escape of smoke when seal of water closet was broken.

Subsequent smoke testing of both these branch drains and the outlet from the chamber has failed to produce a satisfactory result.

Passage between School and Iron Foundry :

A smoke test was applied to the inlet branch of the inspection chamber in the above passage (B). Smoke was applied to this drain for over an hour. No result was at this time obtained in the school, but some hours later smoke was found under the floor of the waiting room. The inspection chamber in the small enclosed yard was raised, but no trace of smoke was found there.

In order to establish a connection between inspection chamber and the school, a smoke test was applied to the branch drain taking appliance 'J' in inspection chamber 'K'. No result was obtained in inspection chamber 'B' from this test. This was again smoke tested for about an hour. A negative result was obtained under the waiting room floor, but evidence of smoke was found in inspection chamber 'K'. A rodding-eye cap was missing from the intersecting trap outlet to this chamber and it was assumed that the smoke was gaining access to the Dickinson Street sewer from this test, and backing up the drain from the sewer and into the inspection chamber. A drain plug was applied to this rodding-eye and the test re-applied with satisfactory results.

The outlet from inspection chamber 'B' was smoke tested without any result showing in the school.

The drains in the inspection chamber in the Phosphating Shed at the Iron Foundry were smoke tested with negative result in the school premises. Other drains in the Foundry were also smoke tested again with negative results.

(C) COLOUR TESTING :

Colour test was applied to the unmade floor in the Phosphating Shed near a tank containing the phosphating solution which had been leaking several weeks before and colour appeared in inspection chamber 'B'. The colour was well flushed through and colour was found in the main sewer at an inspection chamber at the junction of Dickinson Street and Duckworth Street.

Colour tests were applied to all drains to check the whereabouts of the drains for drainage plan.

(D) REVEALER :

An instrument for locating underground drains and pipes was borrowed from the Borough Engineer's Department and this indicated drains at some of the known points. It also indicated a drain under the boiler house floor and a drain across the large enclosed playground from the school to a point under the boundary wall close to inspection chamber '4'. Excavations at these points failed to reveal any drains although under the boundary wall a hole was found where an old drain had been located.

Atmospheric Investigations :

Premises adjoining the school in which timber is treated with wood preservatives was visited. Coke, treated and untreated timber, sawdust and shavings are burned in these premises on a closed stove, the flue pipe of which discharges approximately 2-feet above the roof on the gable end of the building overlooking the school yard. (*See Plan*).

An apparatus was set up in the school gymnasium to obtain a sample of the flue gas emission from this chimney, and samples obtained decolourised the concentrated H₂SO₄ through which the flue gas was bubbled, showing the presence of Hydrocarbons. The samples were delivered to Mr. S. Hargreaves, Blackburn College of Technology and Design for analysis.

A similar apparatus was used in the under-stage area of the Assembly Hall to attempt to detect the presence of Arsene. Although the contents and dust in this under-stage area were disturbed greatly whilst this apparatus was in operation, no Arsene was detected.

General :

Samples were obtained of all the chemicals used in the timber yard and Iron Foundry Phosphating process ; also, treated and untreated timber. These samples were delivered to Mr. S. Hargreaves at Blackburn College of Technology and Design for his analysis.

APPENDIX IV.

Extensive coverage of the St. Hilda's School Outbreak was given in the Medical and Lay press, and by radio and television. The Minister of Health, Mr. Kenneth Robinson, replied to questions in the House of Commons on the outbreak.

Among the more important references in the literature to the outbreak are the following :—

British Medical Journal, 16th October, 1965, quoted in full on Page 18 of this report.

Leading Article : "Winter Vomiting Disease," British Medical Journal, 23rd October, 1965.

British Medical Journal, 1965, 2. 953.

The Times, 19th October, 1965.

"Parliament and Public Health"
The Medical Officer, 24th December, 1965. P. 349.
Schoolgirls, Blackburn (Illness).

"Mrs. Joyce Butler asked the Minister of Health what was the vaccinal condition of schoolgirls who suffered from the recent mystery illness in Blackburn ; and what connection there was between this illness with symptoms similar to those of poliomyelitis, and the poliomyelitis vaccination.

Mr. Robinson (written answer) : I am obtaining the detailed information about vaccinal state and I will write to my Hon. Friend when it is available. I am, however, advised that there is no connection between this illness and poliomyelitis vaccination (6th December).

APPENDIX V.**VACCINATION AND IMMUNISATION HISTORY OF PATIENTS.**

Total number of schoolgirls involved in all categories	118
Number of adult staff involved (female)	1
	119

1. Clinically Ill
2. Clinically Shocked
3. Malingeringers
4. Clinically ill plus hysteria
5. Hysteria

It is considered that group 1 compose the majority of cases.

Vaccination and Immunisation History of the Schoolgirls**A. Smallpox Vaccinations**

37	31.35%	Girls Vaccinated
55	46.61%	Girls NOT Vaccinated
26	22.04%	County girls with no data on records
118	100%	TOTAL

B. Diphtheria Immunisation

29	24.58%	Girls completed course of injections (primary or booster) SINCE 1960
56	47.45%	Girls completed course of injections (primary or booster) BEFORE 1960
16	13.56%	Girls not immunised
17	14.41%	County girls with no data on records
118	100%	TOTAL

C. Poliomyelitis Vaccination with Salk Vaccine

26	22.04%	Girls had 3rd or 4th injection SINCE 1960
21	17.79%	Girls had 3rd or 4th injection BEFORE 1960
51	43.22%	Girls not vaccinated
20	16.94%	County girls with no data on records
118	100%	TOTAL

D. Poliomyelitis Vaccination with Sabin Vaccine

10	8.47%	Girls had one dose before St. Hilda's School Outbreak
75	63.56%	Girls had two doses before St. Hilda's School Outbreak
27	22.89%	Girls had one booster dose before St. Hilda's School Outbreak (<i>See note (1)</i>)
2	1.69%	Girls not vaccinated
4	3.39%	County girls with no data on records
118	100%	TOTAL

NOTE : St. Hilda's School Outbreak commenced on 7.10.1965
 Total number of girls on the school roll - 589.

Comments

(i) Poliomyelitis Vaccination

Many County girls, previously immunised, who were given Oral Vaccine at County Clinics at the time of the Poliomyelitis Outbreak, were given *one* booster dose. This also happened to some Blackburn girls who were on holiday out-of-town at the time.

Otherwise, Blackburnians were asked to undergo a *full* Course of Sabin, irrespective of past history.

(ii) 38 (32.21%) of the 118 girls affected live in the County Area. Records of these girls are not necessarily complete.

(iii) It is known that one girl, a new arrival to the Borough, received a booster dose at Kingston-upon-Thames. No medical records are held in the Department, and consequently no information is available for items A, B and C above.

(iv) One other girl, at least, is known to receive prophylaxis from her own Doctor, but no records have been received in this office.

(v) One School Teacher was also affected. Vaccination history as follows :—

Commenced

July, 1963	Salk	3 Injections
	Poliomyelitis Vaccine	
August, 1965	Sabin (Oral)	2 Doses
	Poliomyelitis Vaccine	
January, 1962	Smallpox Vaccine	Re-vaccination
1945	Smallpox	Re-vaccination
„	Tetanus	1 Injection
„	Diphtheria	Booster
„	B.C.G.	Vaccination
„	Typhoid	Inoculation

APPENDIX VI**QUESTIONNAIRE 'A'**

Surname Home Address

Christian Names

Date of birth School Form.....

1. Were you at the Cathedral for Princess inside / outside / not there Margaret's visit on the Wednesday ; were you inside or outside ? Yes No
2. Did you feel faint ? Yes No
3. Did you fall to the ground or have to lie down ? Yes No
4. Were you at School on the next day (Thursday) ? Yes No
5. Did you feel unwell on that day ? Yes No
6. Where were you when you first felt unwell ?
7. What was the time ?
8. Did you fall to the ground or have to lie down ? Yes No
9. If so, at what time did you first fall/lie down ?
10. Where were you when you first fell/lay down ?
11. Were you taken to the hospital ? Yes No
12. Were you kept in for the night ? Yes No
13. Were you all right on Friday ? Yes No
14. Were you all right on Saturday ? Yes No
15. Were you all right on Sunday ? Yes No
16. Were you at school on Monday ? Yes No
17. Did you feel unwell on that day ? Yes No
18. Where were you when you felt unwell ?
19. What was the time ?
20. Did you fall to the ground or have to lie down ? Yes No
21. If so, at what time did you fall/lie down ?
22. Where were you when you fell/lay down ?
23. Were you taken to hospital ? Yes No
24. Were you kept in for the night ? Yes No
25. Were you at school on the Monday the school finally re-opened ? Yes No
26. Did you feel quite well on that day ? Yes No

QUESTIONNAIRE 'B'

These questions do not apply to the recent outbreak. If you normally feel faint only occasionally, ring 'occasionally' even if you felt faint a lot over the week of the outbreak. Similarly, do not include visits to the doctor or to the hospital during the outbreak in your answers to questions 14 and 15.

Surname.....

Christian Names

Date of Birth..... School Form.....

1. Give the Christian names 1..... 4.....
and ages of your brothers 2..... 5.....
and sisters 3..... 6.....
2. What is your father's occupation ?
3. How many different schools have you attended since the age of 5
(including St. Hilda's).....
4. Did you have a temper as a child ? Yes No
5. Did you suck your thumb ? Yes No
6. Are you a nail biter ? Yes No
7. Have you walked in your sleep ? Never/Occasionally/Sometimes/Often
8. Do you get headaches ? Never/Occasionally/Sometimes/Often
9. Do you feel faint ? Never/Occasionally/Sometimes/Often
10. Do you get stomach-ache ? Never/Occasionally/Sometimes/Often
11. Do you feel sick ? Never/Occasionally/Sometimes/Often
12. Do you vomit ? Never/Occasionally/Sometimes/Often
13. How old were you when you last wet the bed at night ?
14. How many times have you seen your family doctor within the past year ?
15. How many times have you been admitted to hospital in your life ?
16. Have you ever been separated from your parents for more than a month ? Yes No
17. Do you like school ? All the time/most of the time/
some of the time/not much at all
18. What do you want to be when you grow up ?
19. Name your three best friends in the school :
 1. Surname..... Christian Names.....
 2. Surname..... Christian Names.....
 3. Surname..... Christian Names.....
20. Do you belong to a Fan Club ? Yes No
21. How many pop records do you own ?
22. Do you ever go right off your food and eat nothing for a day or two ? Yes No
23. On an ordinary day, do you watch T.V. for more than an hour or less ? More Less

CONCLUSIONS

- (a) This outbreak should not be confused with outbreaks of winter vomiting syndrome, or gastro/intestinal infectious conditions described in the literature.
- (b) The episode was, in our opinion, due to complex causes of a sophisticated nature, and could not be attributed to any single agency.
- (c) The suggestion that the St. Hilda's girls were of such a constitutional nature as to be particularly psychologically susceptible in contra distinction to their fellows in other schools, and so manifested simple mass hysteria is not thought to be valid.
- (d) Of the multifactorial stresses to which these girls were subjected, the one of toxic inhalation carries with it too many positive co-incidental features to be ignored completely.
- (e) Finally, after very careful assessment of all the circumstances and researches it would be most reasonable to keep a completely open mind on the etiology of the outbreak and merely present the data for perusal by future Medical Officers who may be faced with similar situations.

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